2017 Iowa Spring Spotlight Survey
Iowa Department of Natural Resources

Dan J. Kaminski, Wildlife Research Biologist, Iowa DNR
Tyler M. Harms, Wildlife Biometrician, Iowa DNR
Jim M. Coffey, Forest Wildlife Research Biologist, Iowa DNR
Vince D. Evelsizer, Furbearer Research Biologist, Iowa DNR

Wildlife population data capable of reliably estimating species abundance are often difficult, expensive, and time consuming to collect, particularly for rare or elusive species, or species that exist at large spatial scales. In the absence of abundance estimates, reliable long-term indices are essential for monitoring and managing wildlife populations. Spring spotlight surveys have been used to survey wildlife populations since the mid-20th Century (South Dakota Department of Game, Fish and Parks 1950; Anderson 1959) and the data are effective for modeling and tracking population trends for a variety of species including Virginia opossum (*Didelphis virginiana*; Gehrt et al. 2006), Northern raccoon (*Procyon lotor*; Gehrt et al. 2002), red fox (*Vulpes vulpes* ; Ruette et al. 2003), and white-tailed deer (*Odocoileus virginianus*; Rybarczyk 1978). An understanding of the complex relationships between environmental and anthropogenic factors and species trend data allow for reliable inference about population abundance along with a better ability to make science-based management decisions for sustaining viable wildlife populations for current and future generations.

In 1978, the Iowa Department of Natural Resources (DNR; formerly the Iowa Conservation Commission) initiated the Spring Spotlight Survey due to the concern that all-time high raccoon pelt prices threatened an over-harvest and would negatively impact the sustainability of the population. Spotlight routes were established along forested habitats to survey for raccoon and white-tailed deer (see Appendix A–E). In general, from 1978–1990, 85 spotlight routes were established across the state and from 1991–1995, 5 additional routes were added.

In 2006, a new survey methodology was developed in which survey routes were oriented in an east-west direction to achieve a more representative coverage of the habitat types across the state and to allow for density estimation of deer. Several additional furbearer species were added including American badger (*Taxidea taxus*), American mink (*Mustela vison*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), Northern river otter (*Lontra canadensis*), red fox, striped (*Mephitis mephitis*) and Eastern spotted skunk (*Spilogale putorius*), Virginia opossum, weasels (*Mustela* sp.), and woodchuck (*Marmot monax*). The new methodology was tested concurrently with the original survey and found to result in similar trends with less variability. Therefore, in 2012, the new methodology was adopted and survey routes added to all 99 Iowa counties. The Spring Spotlight Survey works relatively well for collecting observations on deer, raccoon, striped skunk, coyote, opossum, and red fox. However, observations for badger, bobcat, gray fox, jackrabbit, mink, river otter, spotted skunk, woodchuck, and weasels are more variable due to the secretive nature, low population density, or low detectability of these species. Thus, observations for these species are collected incidentally and a low count using this method does not imply low population abundance for all species (e.g., bobcat or river otter).

The Spring Spotlight Survey is conducted statewide each year between mid-March and late-April. The timing of each survey is dependent on local weather conditions and the latitudinal timing of vegetation leaf-out across the state. To standardize the survey across years, and because weather variables have been shown to correlate with activity patterns for some wildlife species (Rybarczyk 1978), surveys are conducted during periods of no precipitation, wind speeds <15 mph, relative humidity ≥40%, and temperature >32°F. In general, 2 east–west oriented survey transects (3 in Kossuth County) are located along rural non-paved roads in each Iowa county (one in the north and south halves of each county). Transects average 24.0 mi (3.1–43.3 mi; σ=4.48 mi) and total about 4,780 mi statewide (Figure 1). Surveys are conducted by two observers (one driver and one passenger both surveying their respective side of the road) at a speed of <20 mph in which all species clearly identified out to the maximum range of the spotlight (typically ≤0.25 mi for deer and ≤150 yd for furbearers) are recorded. The location and the number of individuals observed for each species are collected at the observer's location using a Global Positioning System (GPS) device. For deer, the distance and bearing to each deer (or group of deer) from the observer, and number of individuals within each group, are recorded for estimating population density.

The following pages report species-specific trends by county and region of the state for species with typically ≥5 observations recorded per year.

In 2017, 4,794 mi of transects were surveyed in 99 counties. In total, 13,017 white-tailed deer, 3,695 raccoon, 297 opossum, 200 feral house cat, 138 striped skunk, 108 coyote, 38 red fox, 5 mink, and 3 bobcat were recorded. Because the number of transect miles may vary in each county annually (e.g., due to bridge closures, etc.), observations were standardized as the mean number of observations per mile surveyed for reporting long-term trends and 95% confidence intervals. In general, the mean number of deer, badger, raccoon, coyote, opossum, striped skunk, and house cat observed per mile were similar to the previous year (Table 1). Although not significant changes, the mean number of bobcat and red fox observed per mile increased and the mean number of mink observed per mile decreased compared to the previous year.

Table 1. Iowa Spring Spotlight Survey mean observations per mile surveyed for current and previous survey year by species.

	2017		2016	
	[1]OPMS	[2]CI	[1]OPMS	[2]CI
American Badger	0.0035	0.0020	0.0039	0.0024
American Mink	0.0011	0.0010	0.0027	0.0016
Bobcat	0.00081	0.00080	0.00022	0.00044
Coyote	0.023	0.0054	0.024	0.0067
Northern Raccoon	0.76	0.088	0.77	0.078
Red Fox	0.0084	0.0045	0.0063	0.0027
Striped Skunk	0.029	0.0064	0.031	0.007
Virginia Opossum	0.063	0.011	0.060	0.012
White-tailed Deer	2.68	0.42	2.58	0.35
Domestic House Cat	0.043	0.011	0.052	0.013

[1]Observations per mile surveyed

[2]95% Confidence interval

Acknowledgements

We thank all current and past Iowa DNR staff and volunteers who traveled thousands of miles of gravel roads across the state, often until early morning hours, to successfully complete the Spring Spotlight Survey each year. We also thank the late Willy Suchy (former Iowa DNR Wildlife Research Supervisor) for his efforts to expand the survey statewide and across multiple species taxa, and improve the quality of the data collected to help us better manage Iowa's wildlife resources for current and future generations.

Literature Cited

Anderson, C. F., Jr. 1959. Nocturnal activities of the Columbia black-tailed deer (Odocoileus heminous columbianus Richardson) affecting spotlight census results in the Oregon coast range. Thesis, Oregon State College, Corvallis, USA.

Gehrt, S. D., G. F. Hubert, Jr., and J. A. Ellis. 2002. Long-term population trends of raccoons in Illinois. Wildlife Society Bulletin 30:457–463.

Gehrt, S. D., G. F. Hubert, Jr., and J. A. Ellis. 2006. Extrinsic effects on long-term population trends of Virginia opossums and striped skunks at large spatial scales. American Midland Naturalist 155:168–180.

Ruette, S., S. Philippe, and M. Albaret. 2003. Applying distance-sampling methods to spotlight counts of red fox. Journal of Applied Ecology 40:32–43.

Rybarczyk, W. B. 1979. Evaluation of a spotlight survey technique as an index to Iowa white-tailed deer (Odocoileus virginianus) and raccoon (Procyon lotor) populations. Thesis, Iowa State University, Ames, USA.

South Dakota Department of Game, Fish and Parks. 1950. 1949 Spotlight Observations in the Black Hills. South Dakota Game Report. Project 12-R-7. Division of Wildlife, South Dakota Department of Game, Fish and Parks, Pierre, USA.

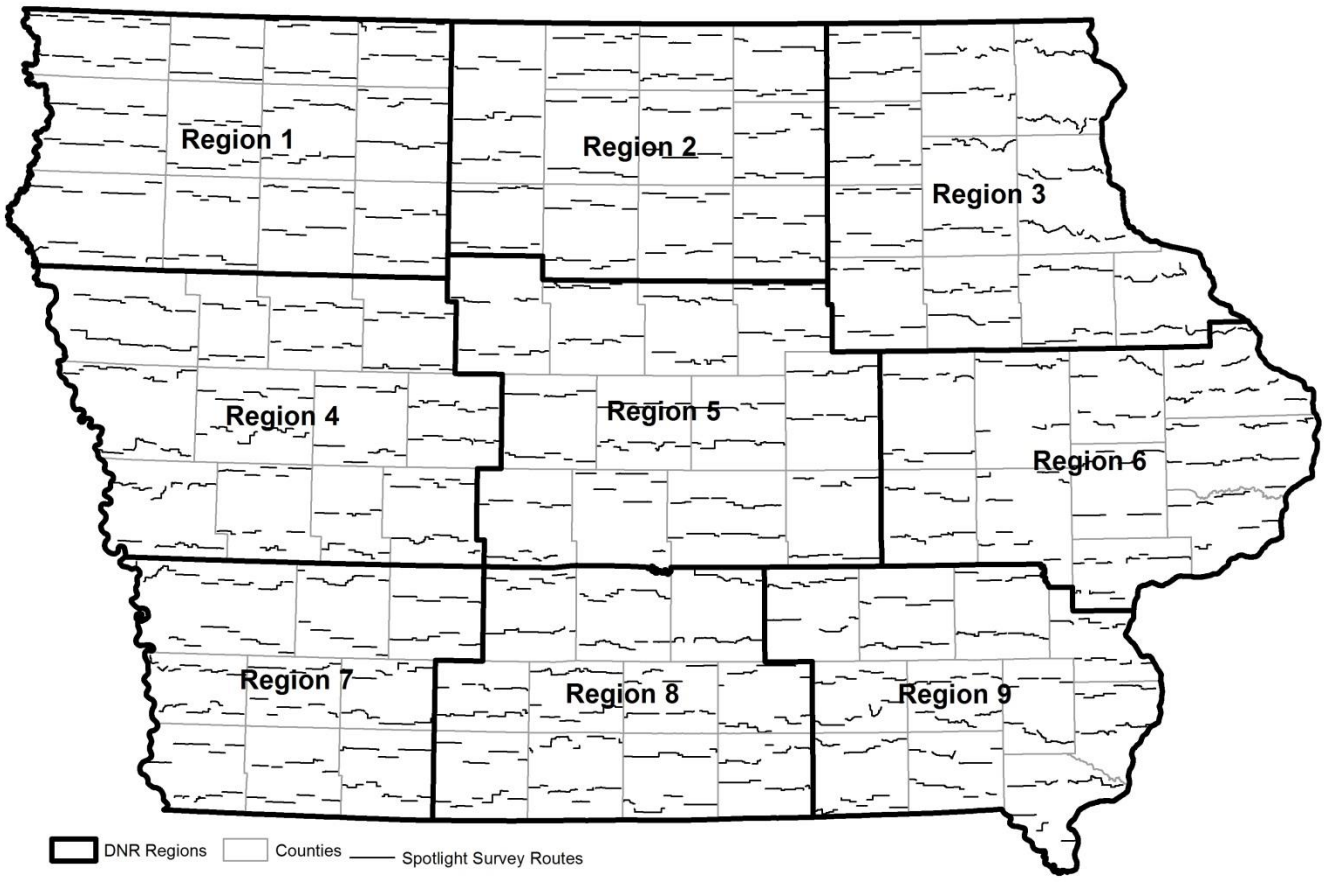


Figure 1. Iowa Department of Natural Resources management regions used for summarizing Spring Spotlight Survey observations. The Spring Spotlight Survey is conducted along 2 east-west oriented transect routes within each Iowa county (3 in Kossuth County) from mid-March to late-April, annually.

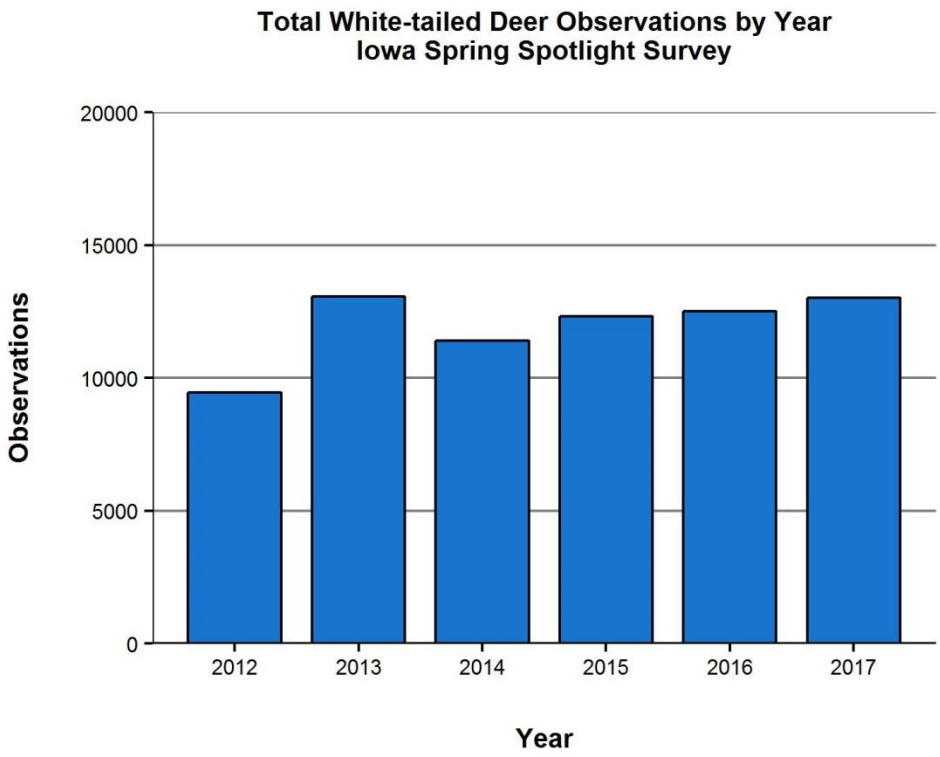


Figure 2. Total statewide white-tailed deer observations during the Iowa Spring Spotlight Survey, 2012–present.

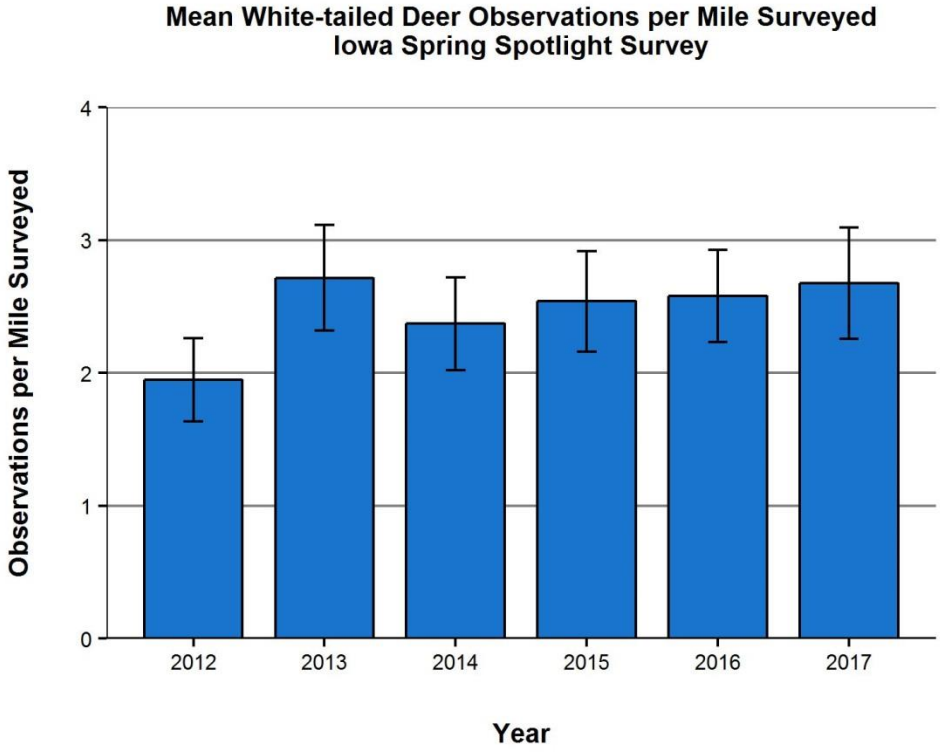


Figure 3. Mean white-tailed deer observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

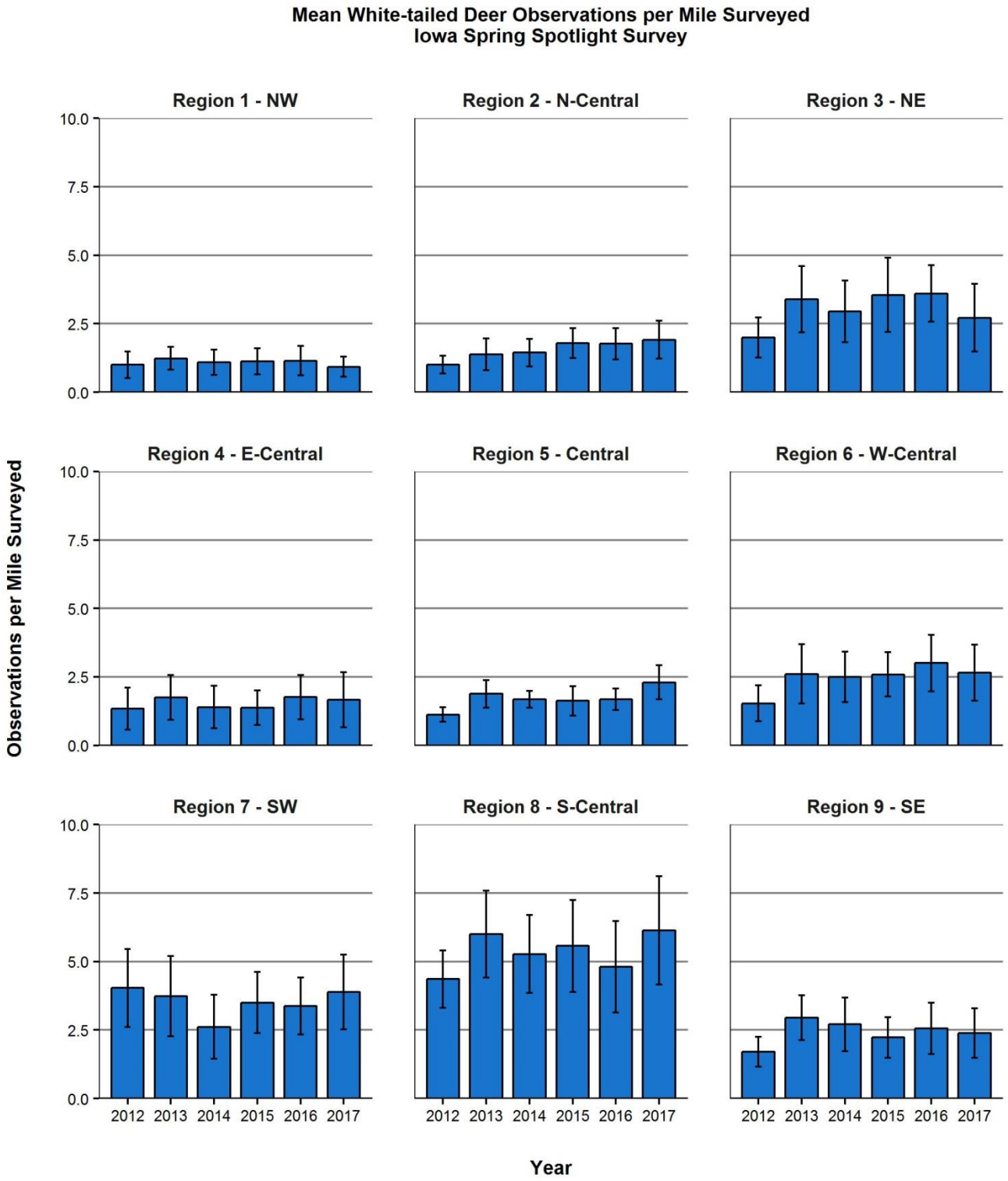
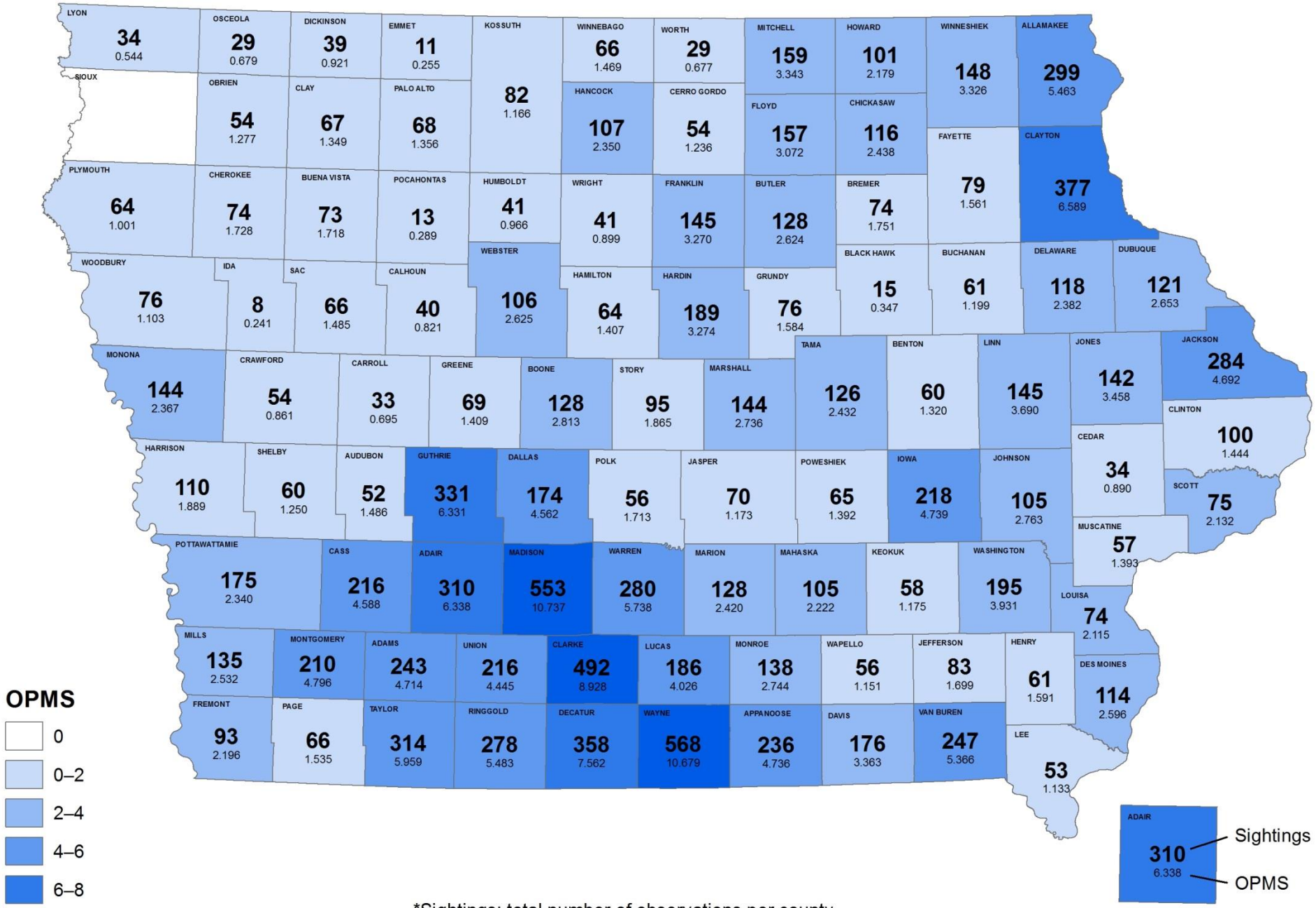


Figure 4. Mean white-tailed deer observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

White-tailed Deer Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

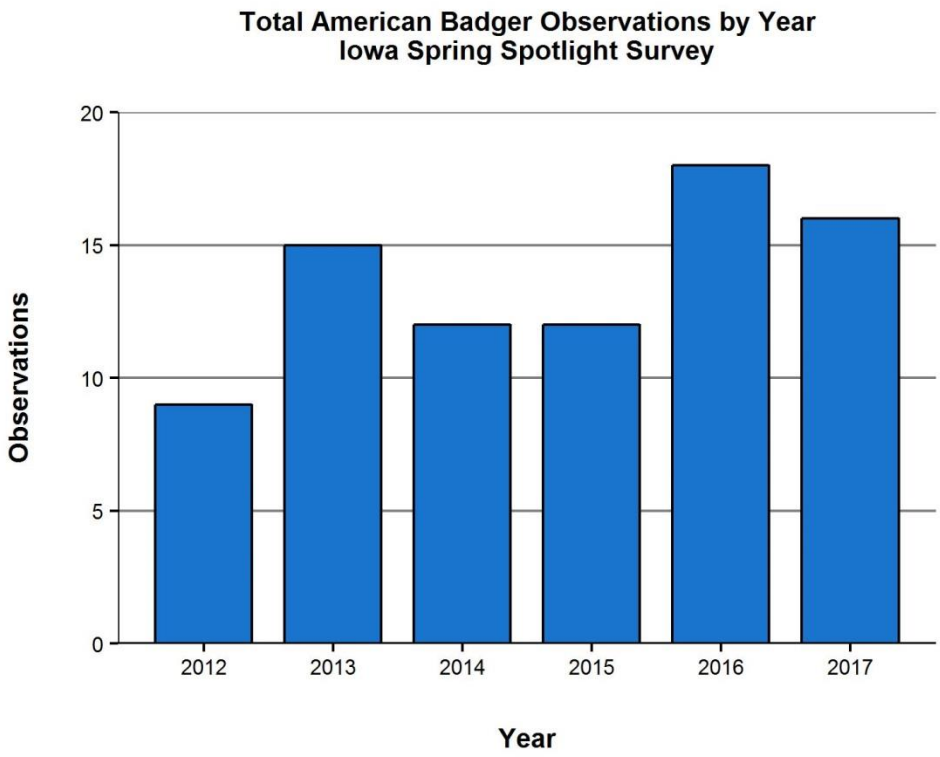


Figure 6. Total statewide American badger observations during the Iowa Spring Spotlight Survey, 2012–present.

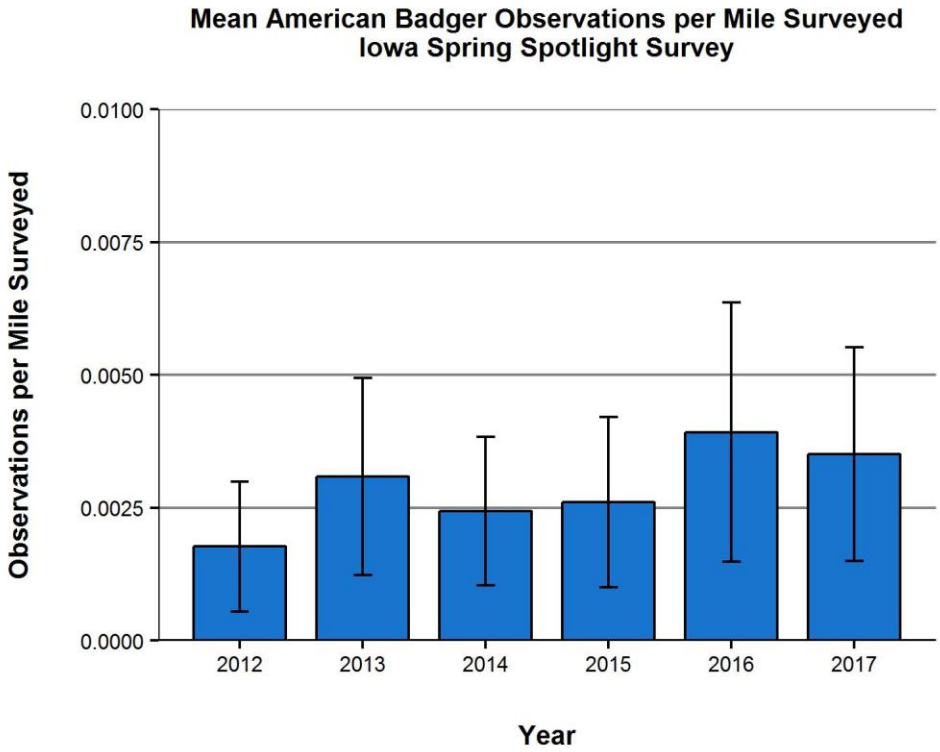


Figure 7. Mean American badger observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

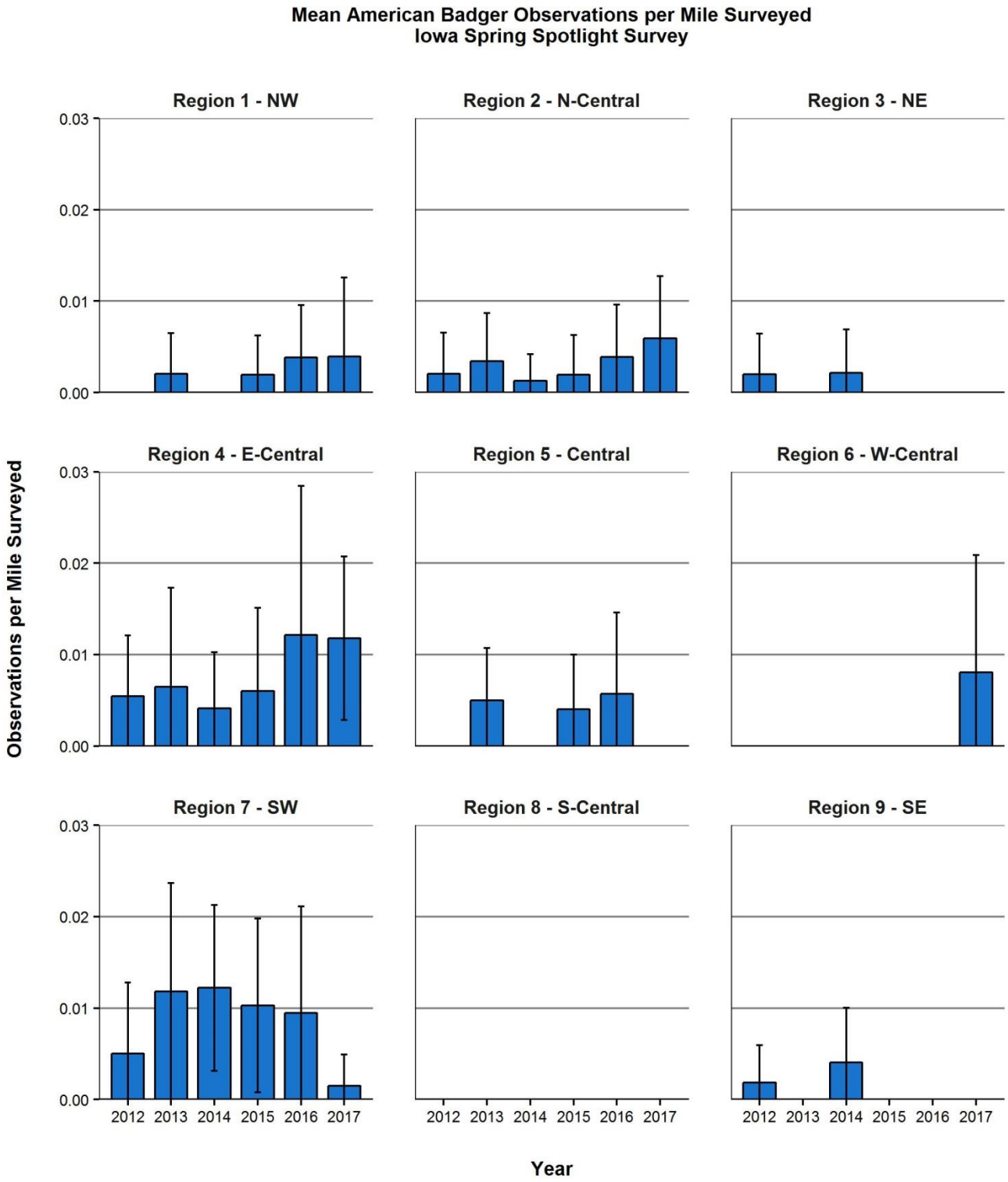
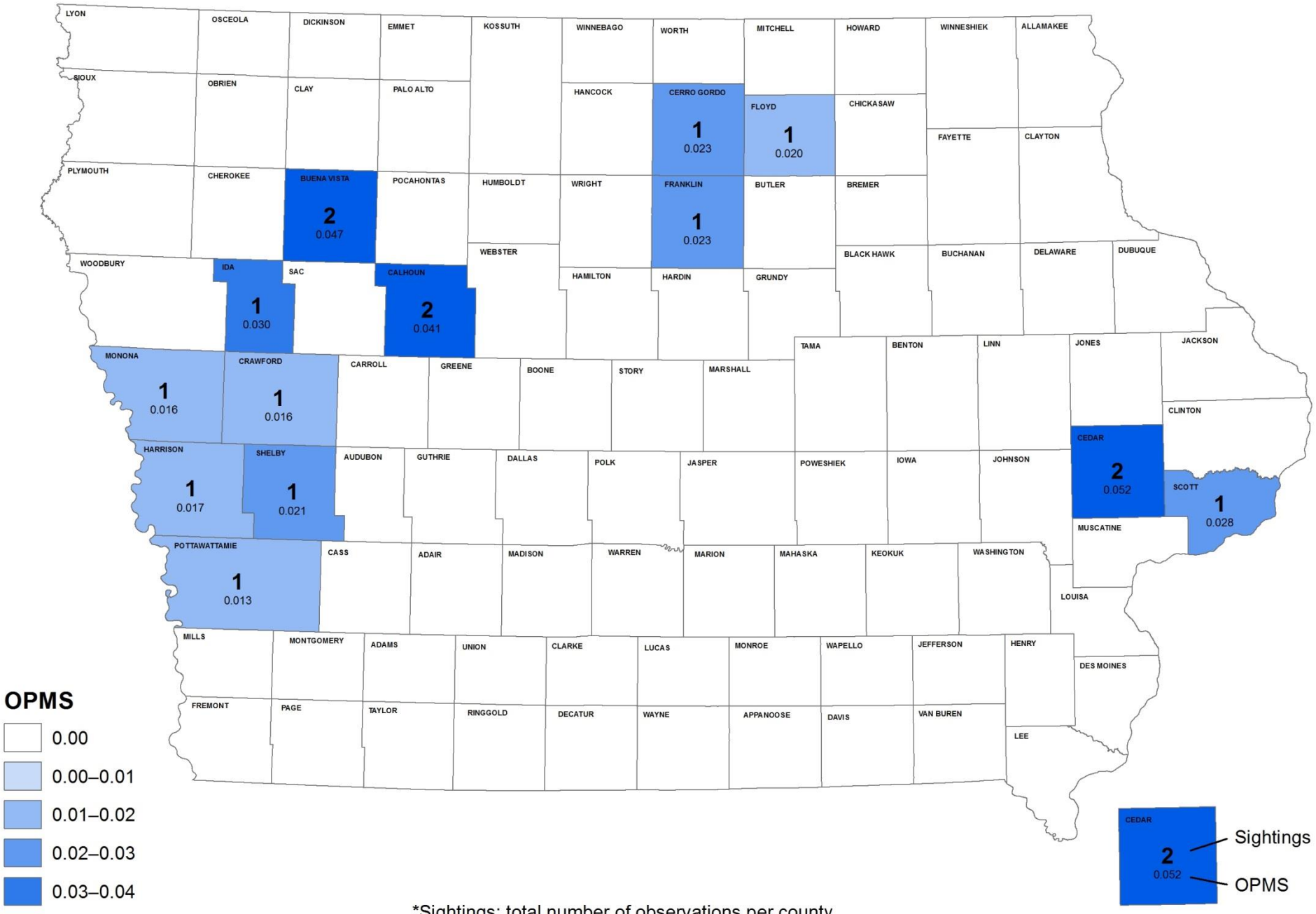


Figure 8. Mean American badger observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

American Badger Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

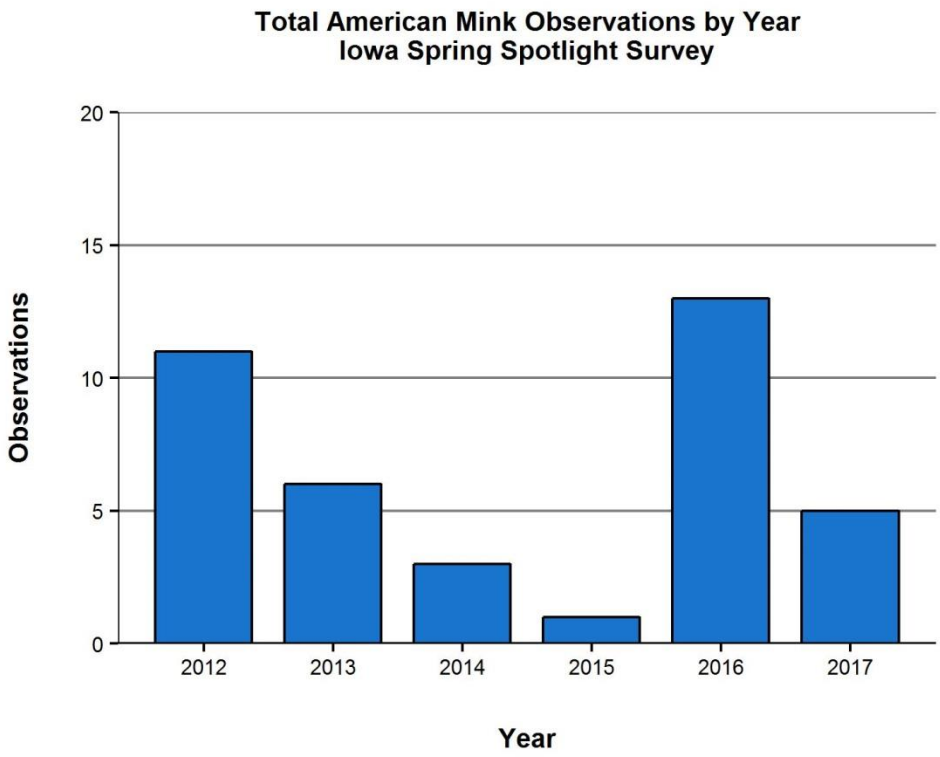


Figure 10. Total American mink observations by year during the Iowa Spring Spotlight Survey, 2012–present.

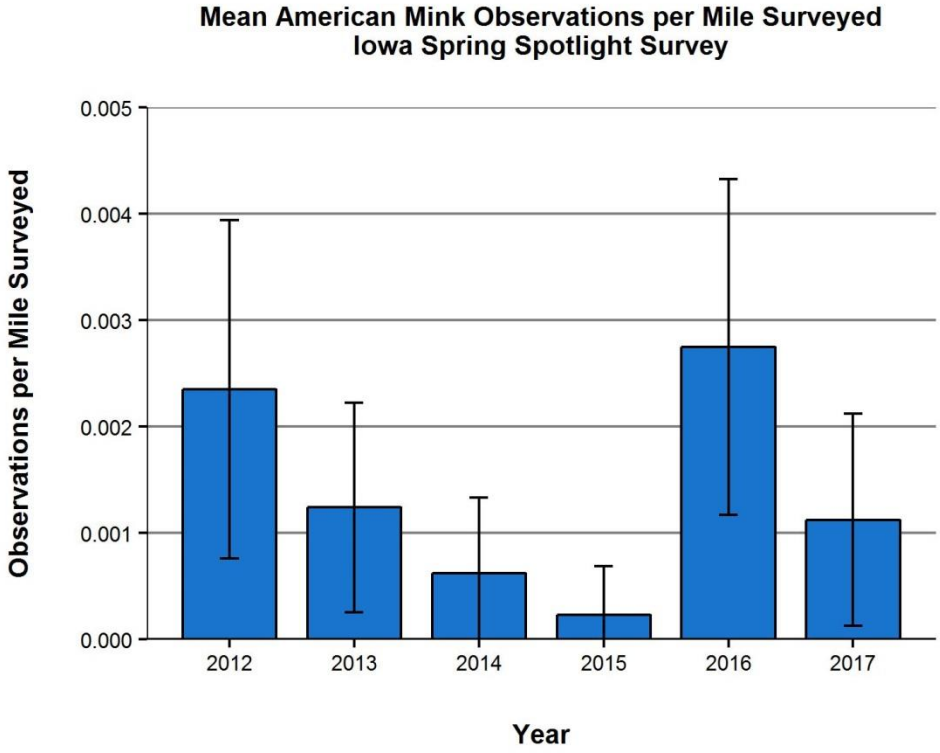


Figure 11. Mean American mink observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

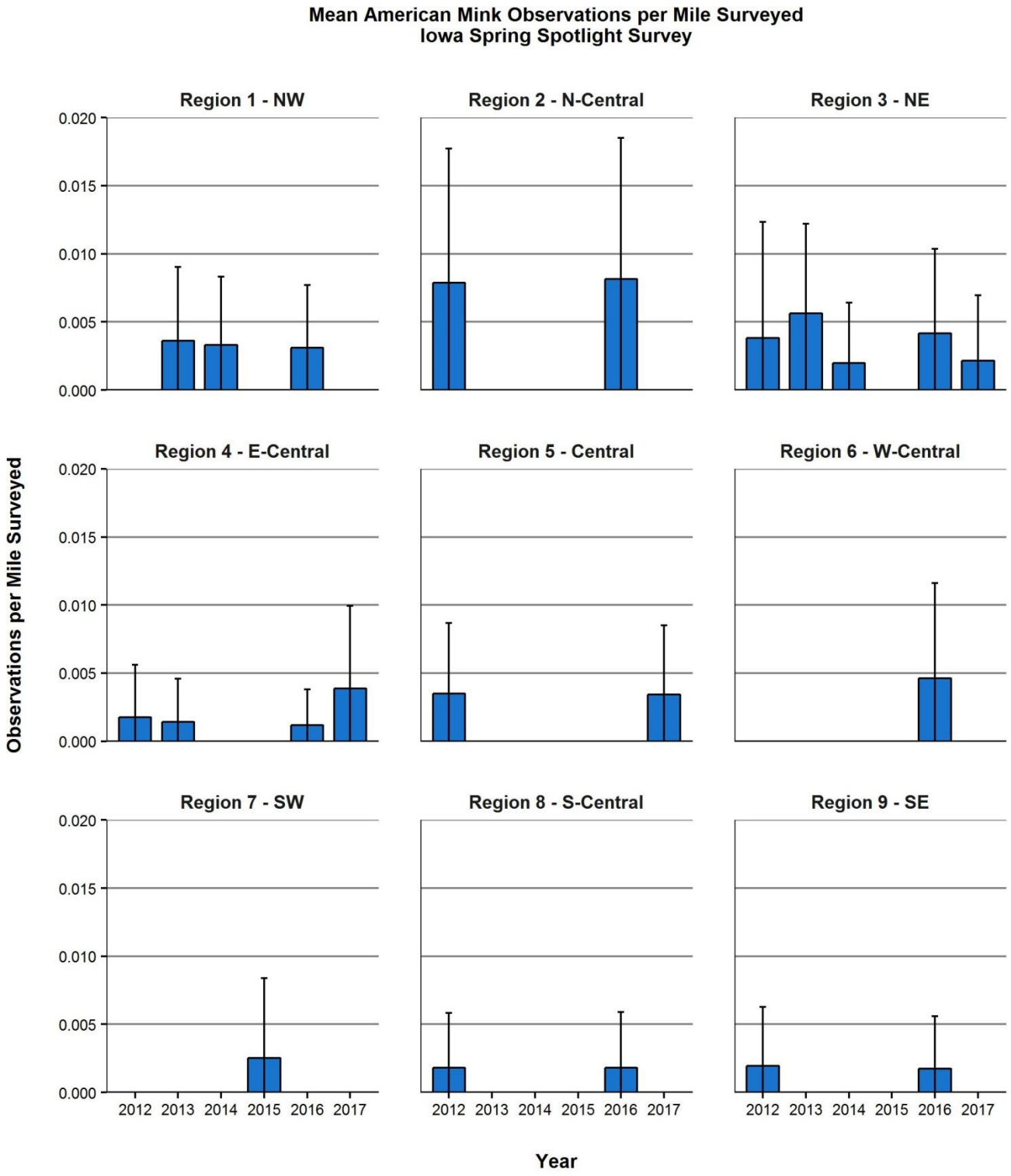
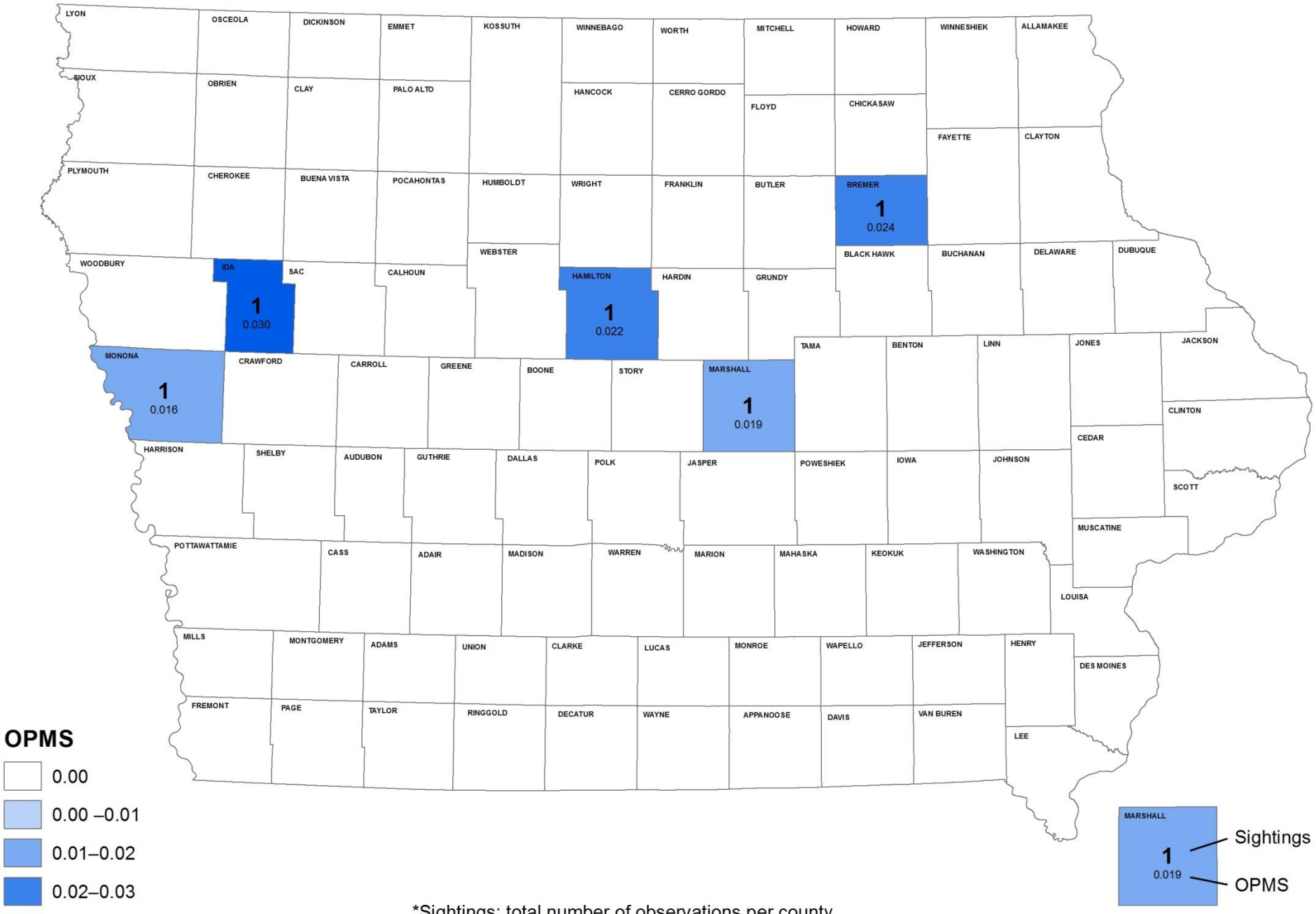


Figure 12. Mean American mink observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

American Mink Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

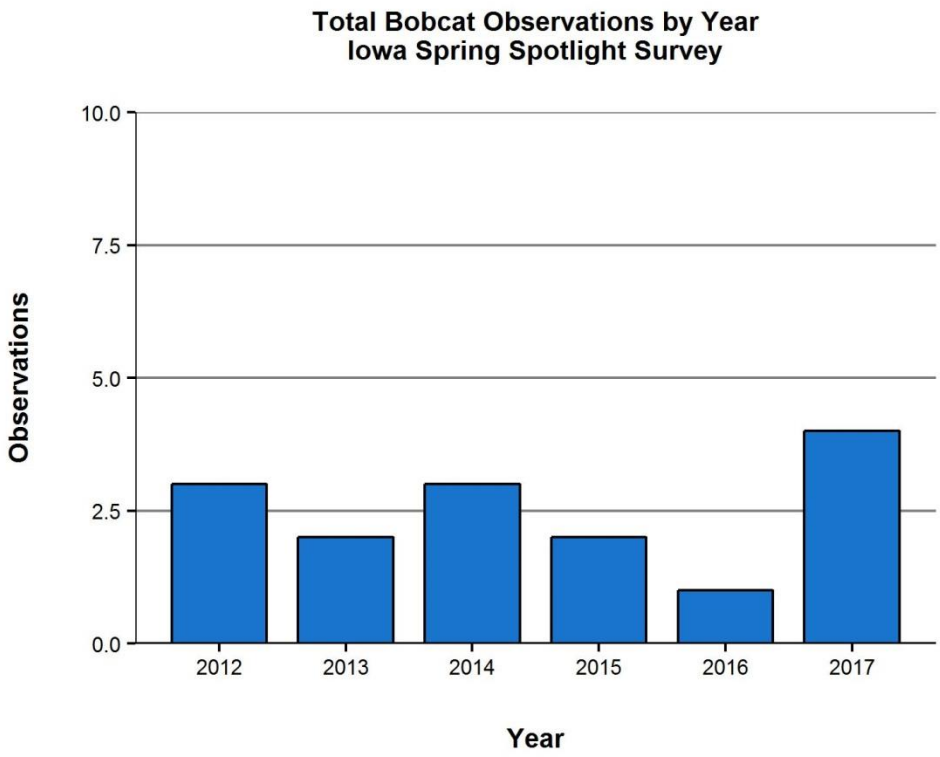


Figure 14. Total bobcat observations by year during the Iowa Spring Spotlight Survey, 2012–present.

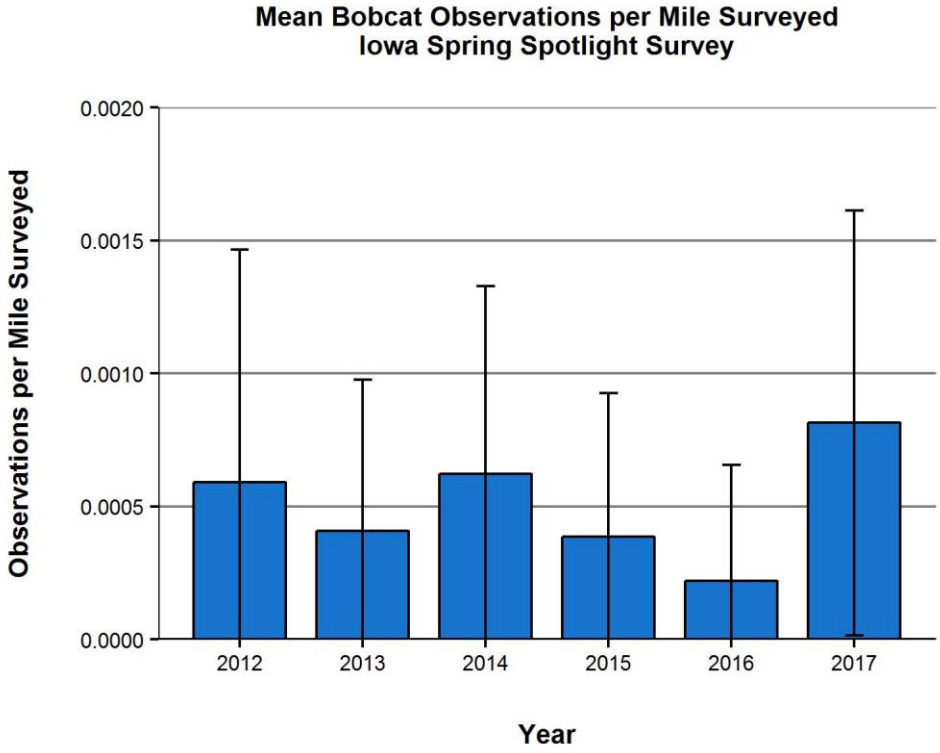


Figure 15. Mean bobcat observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

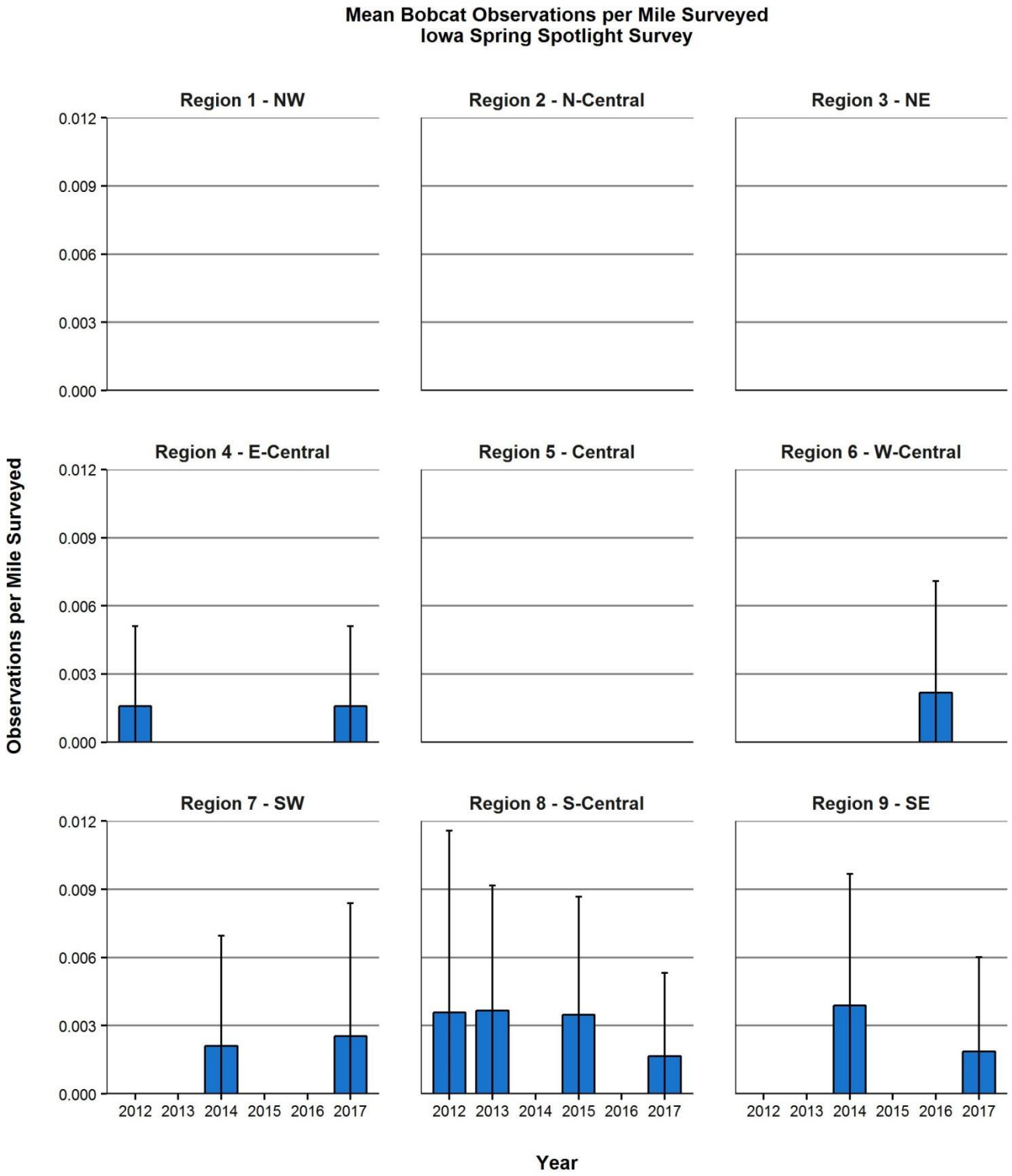
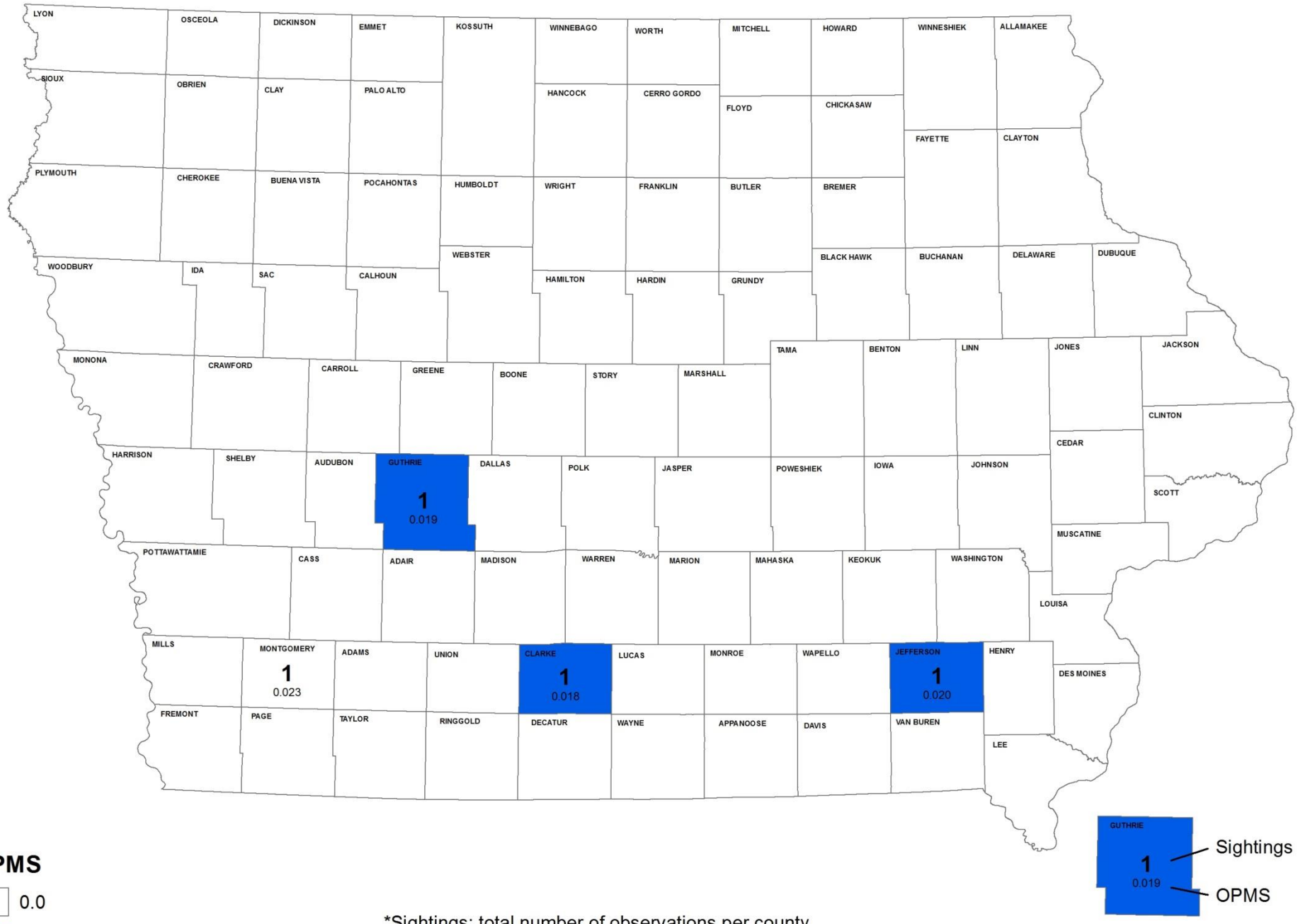


Figure 16. Mean bobcat observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

Bobcat Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

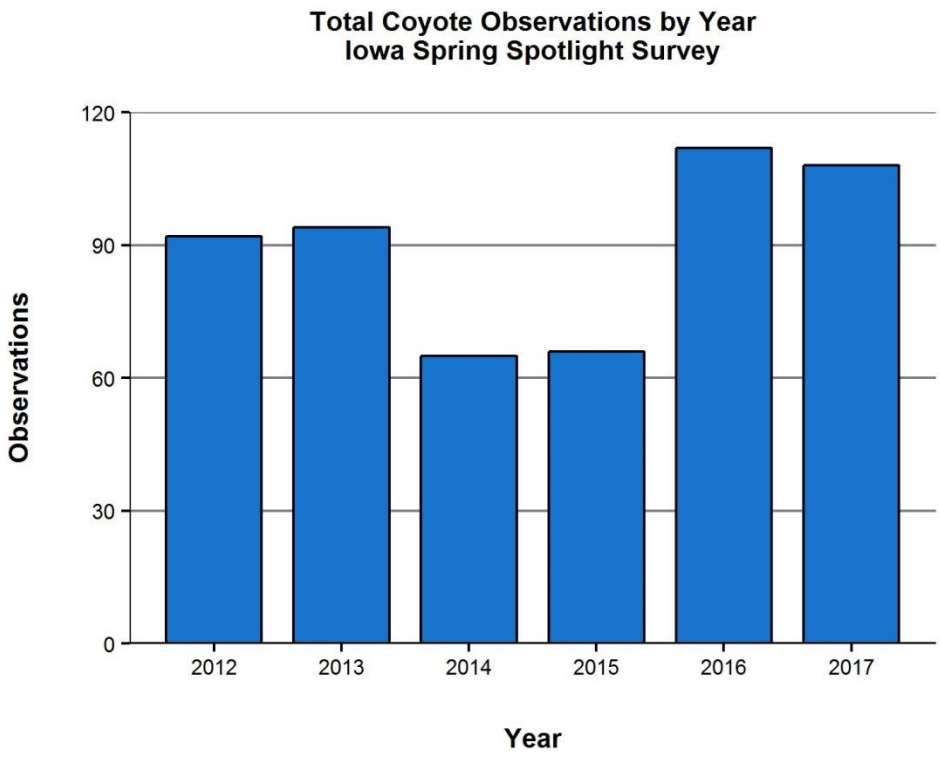


Figure 18. Total coyote observations by year during the Iowa Spring Spotlight Survey, 2012–present.

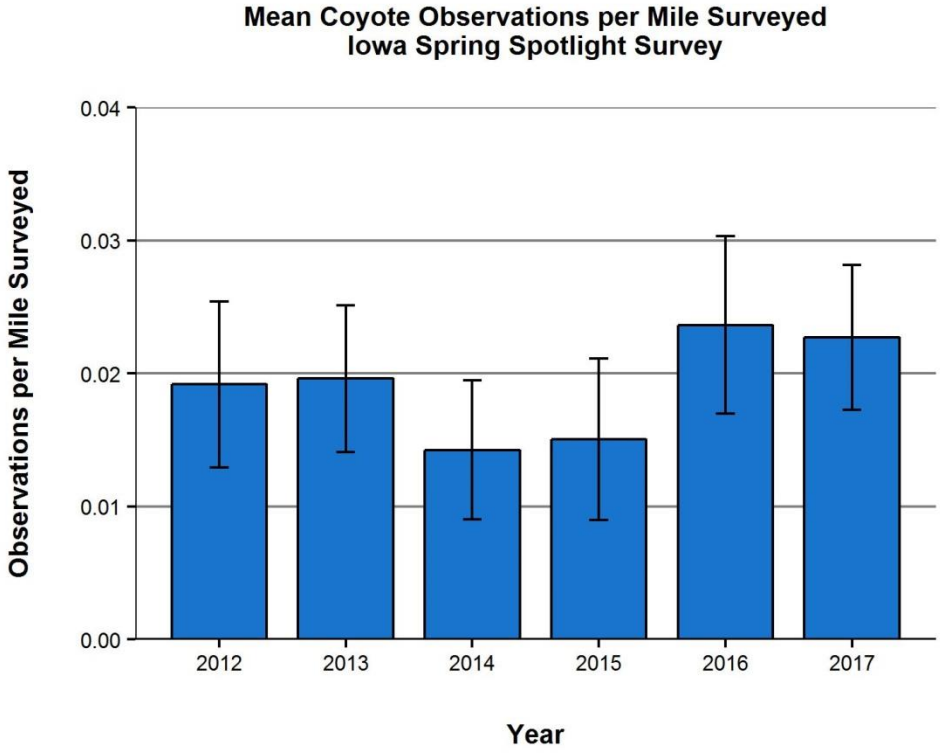


Figure 19. Mean coyote observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

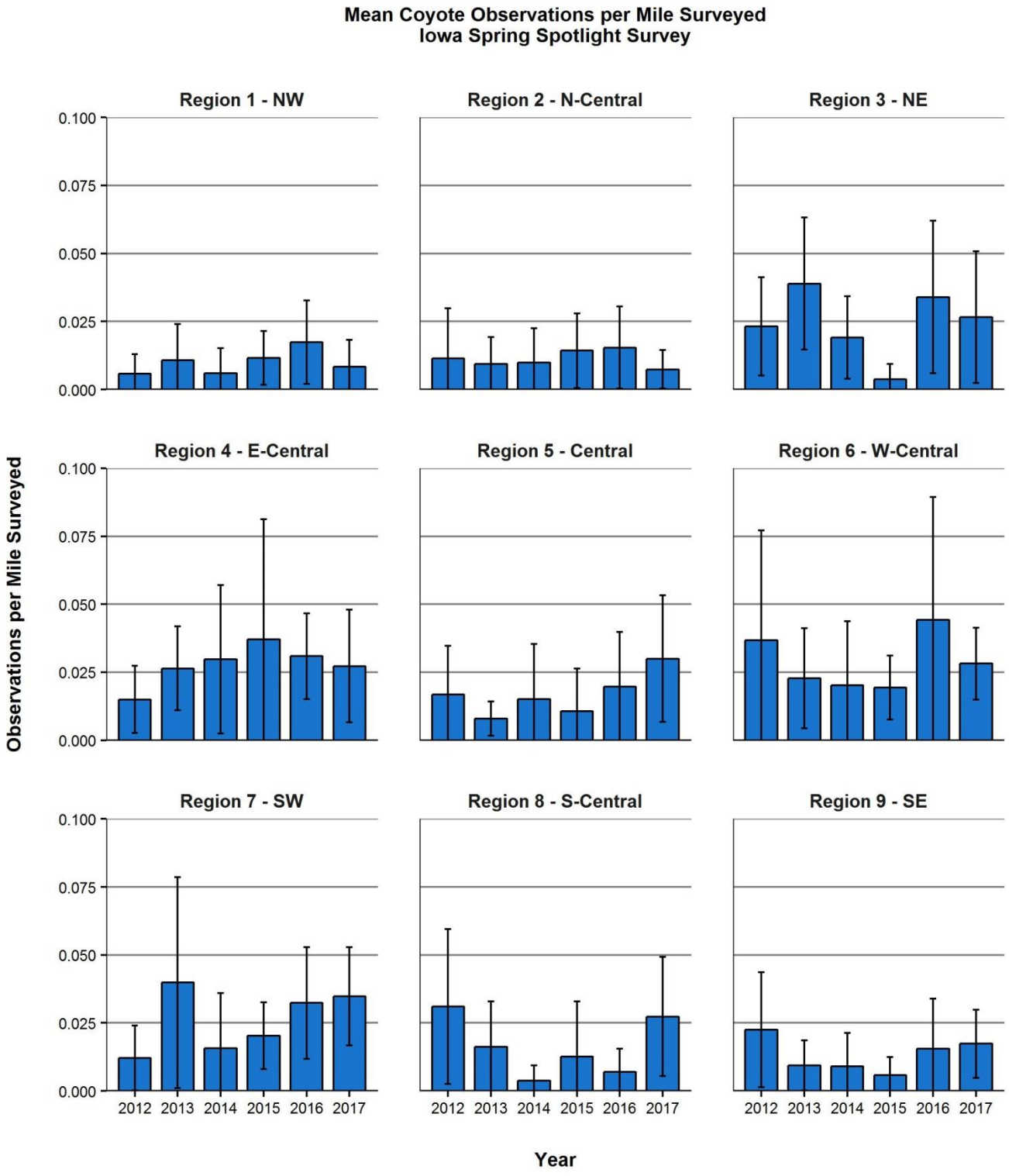
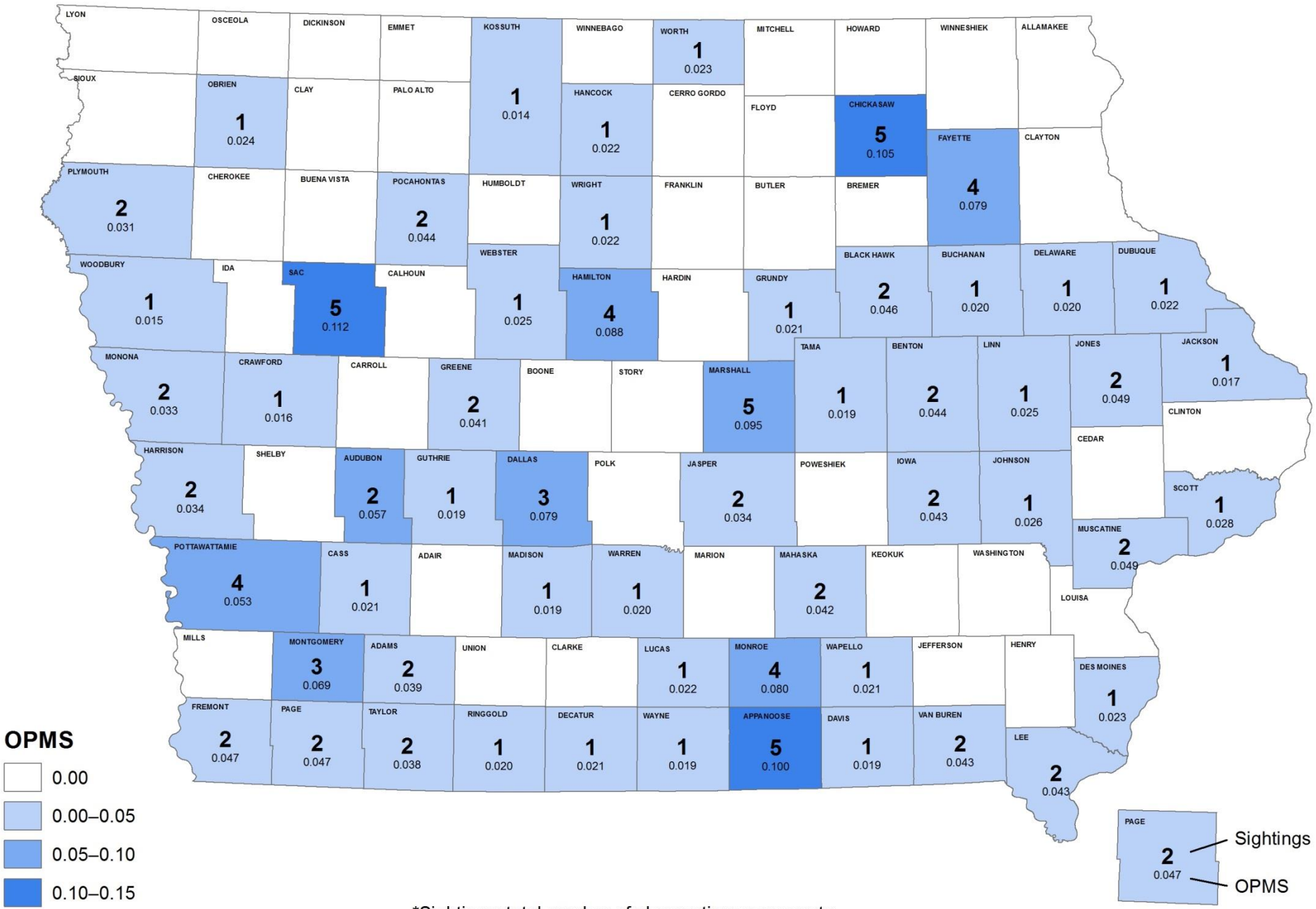


Figure 20. Mean coyote observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

Coyote Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

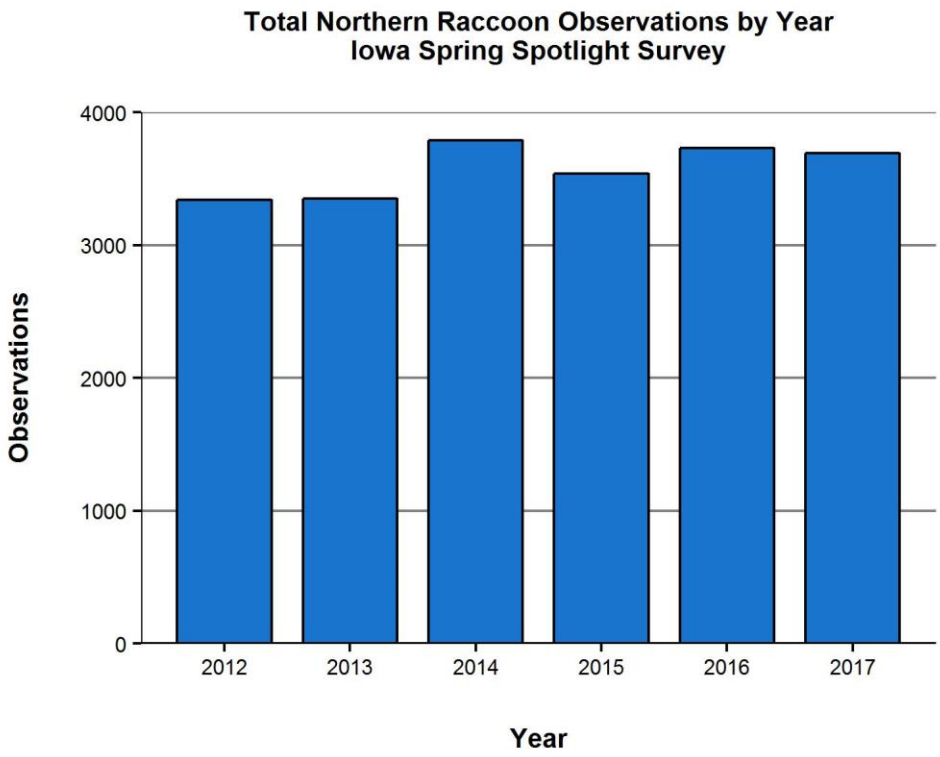


Figure 22. Total Northern raccoon observations by year during the Iowa Spring Spotlight Survey, 2012–present.

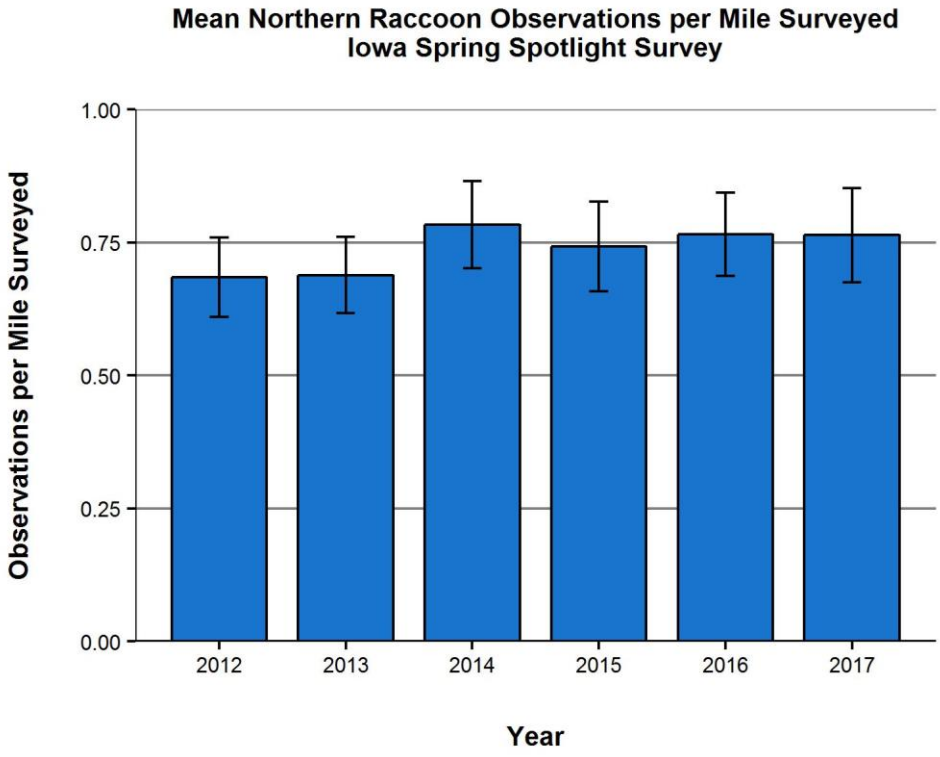


Figure 23. Mean Northern raccoon observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

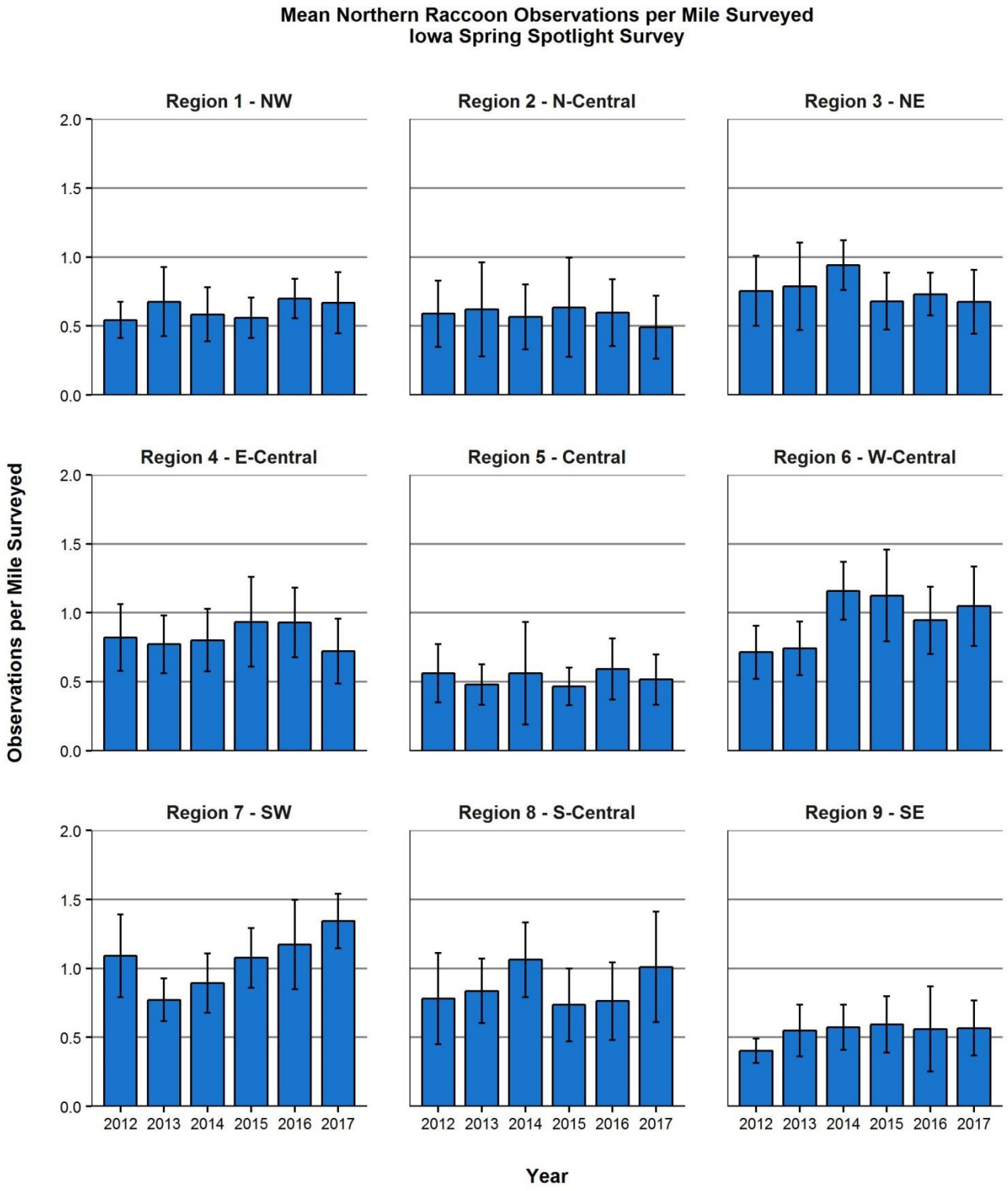
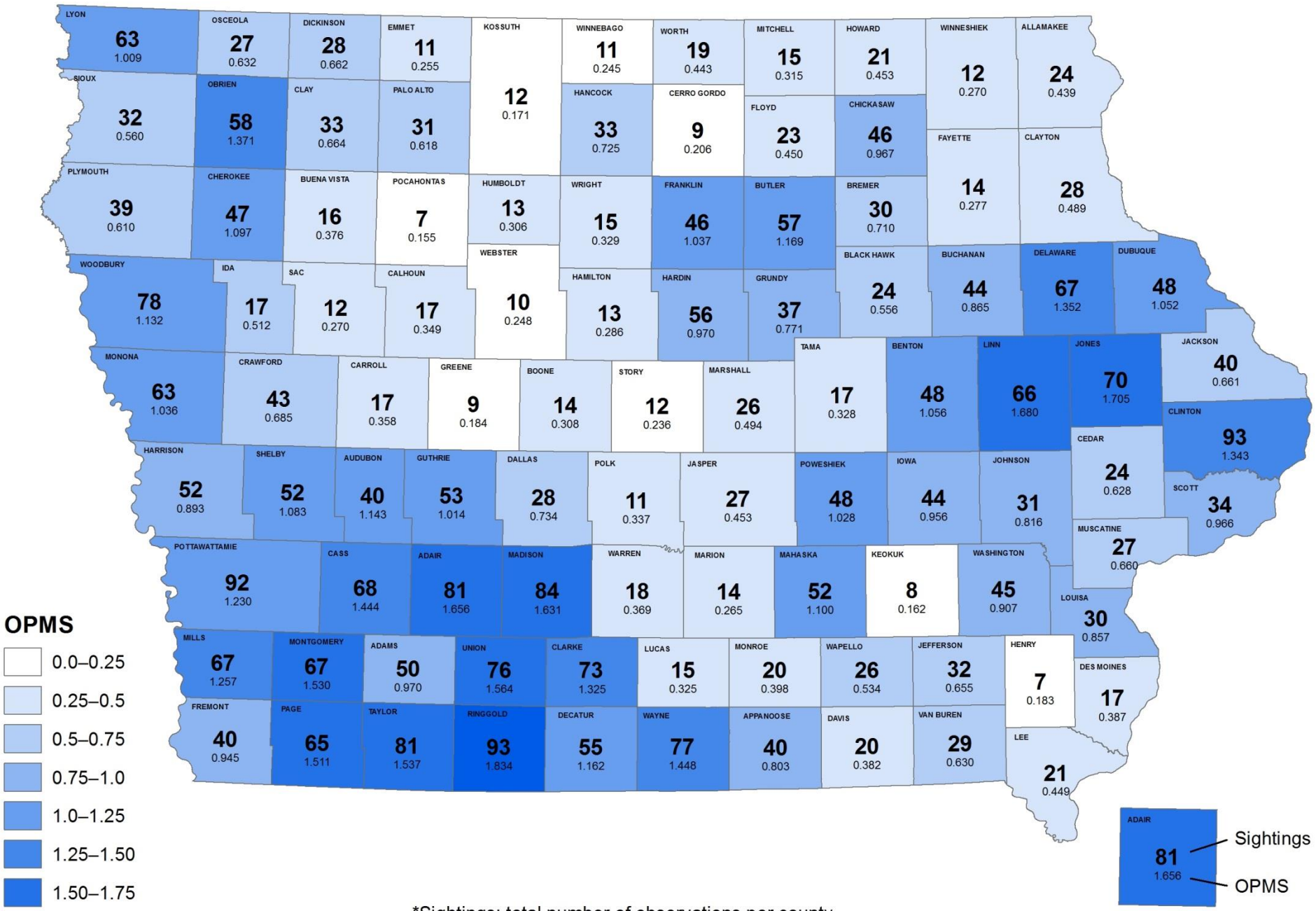


Figure 24. Mean Northern raccoon observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

Northern Raccoon Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

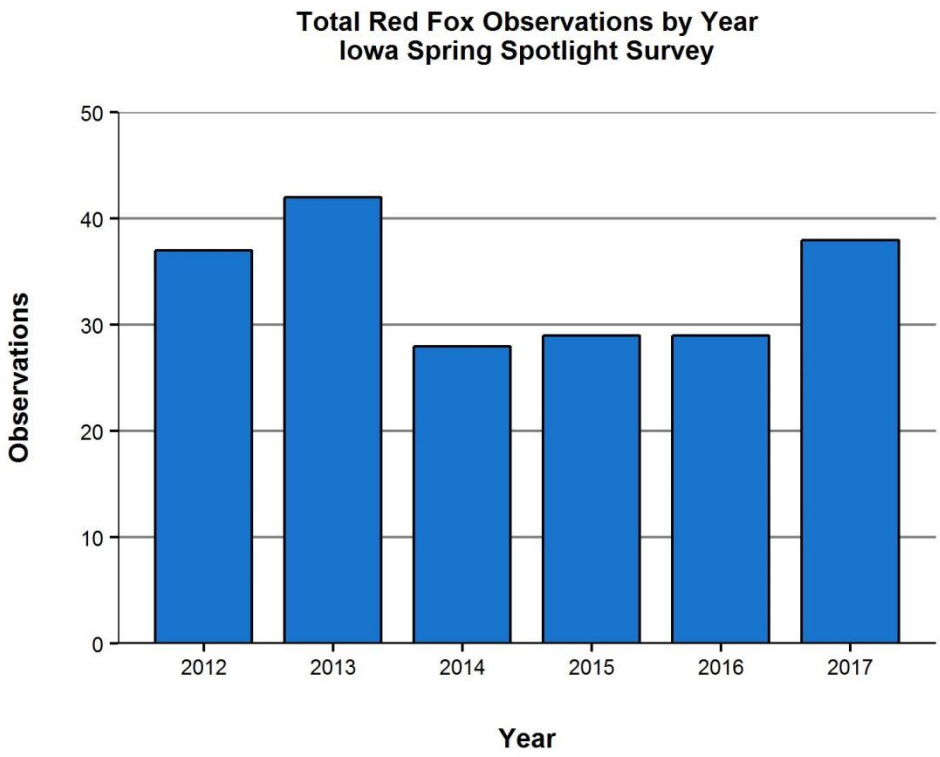


Figure 26. Total red fox observations by year during the Iowa Spring Spotlight Survey, 2012–present.

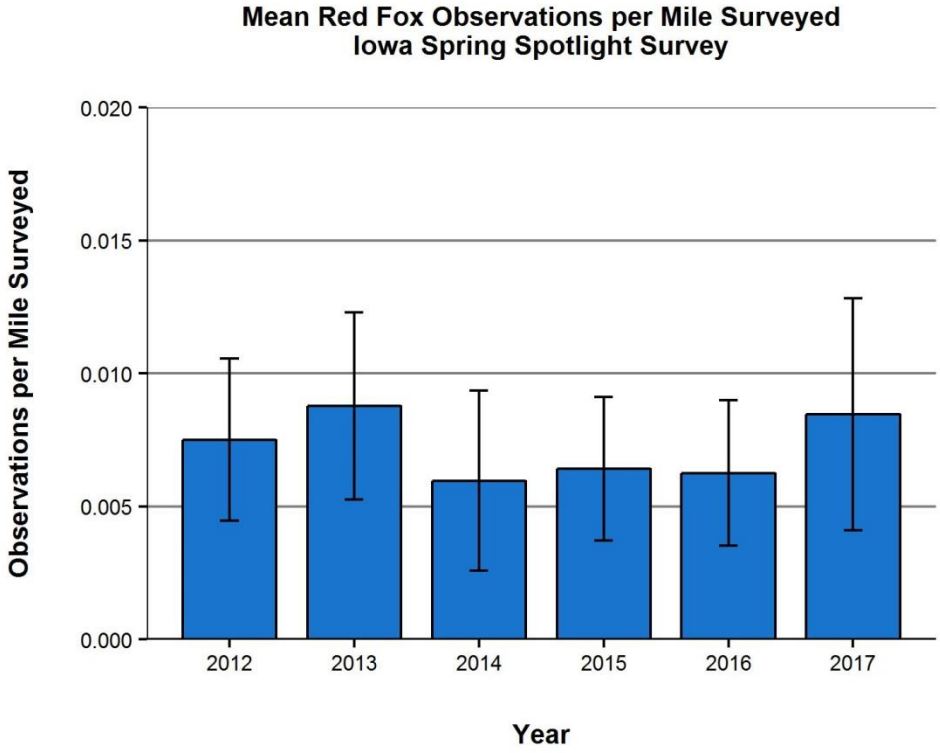


Figure 27. Mean red fox observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

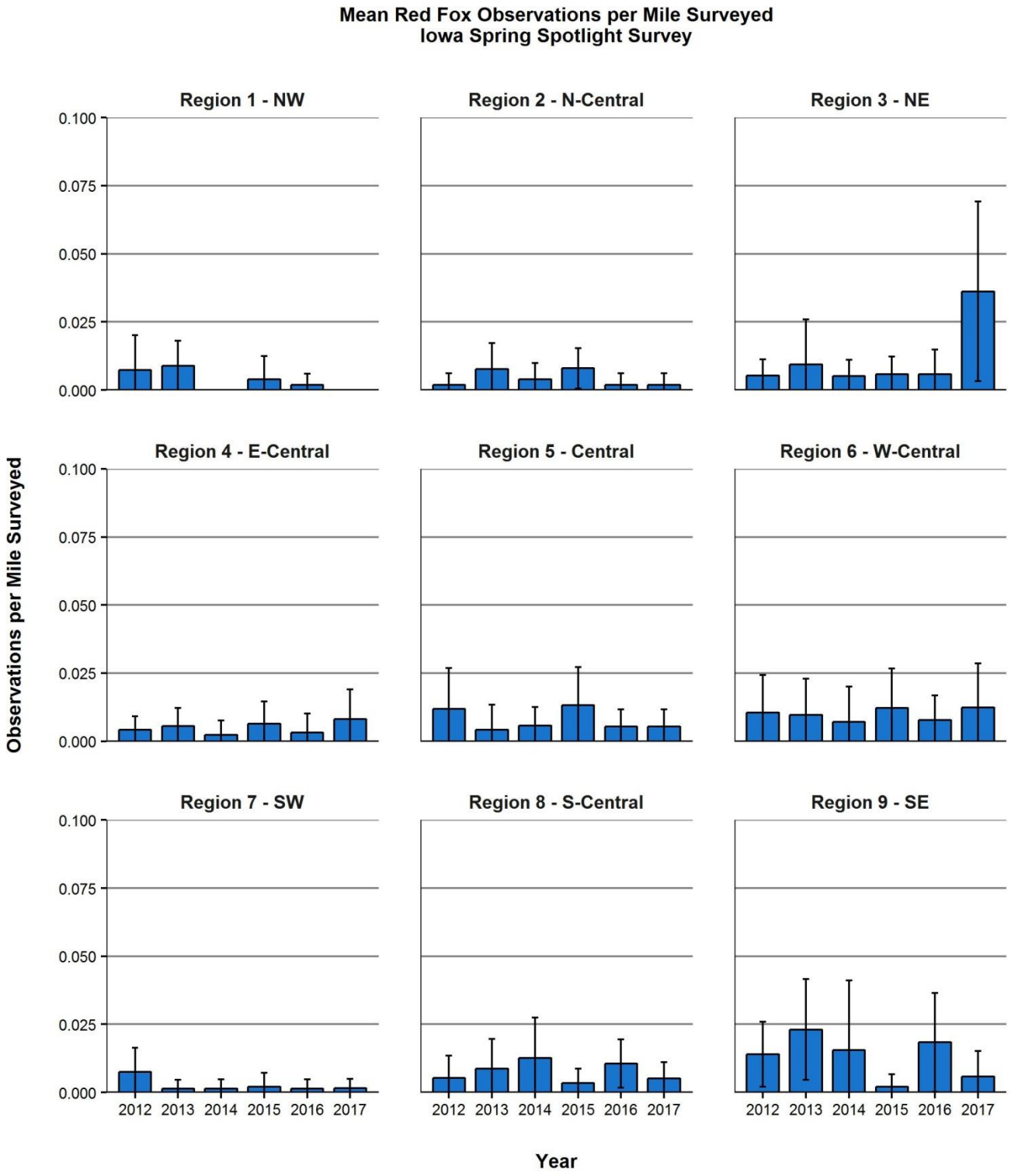
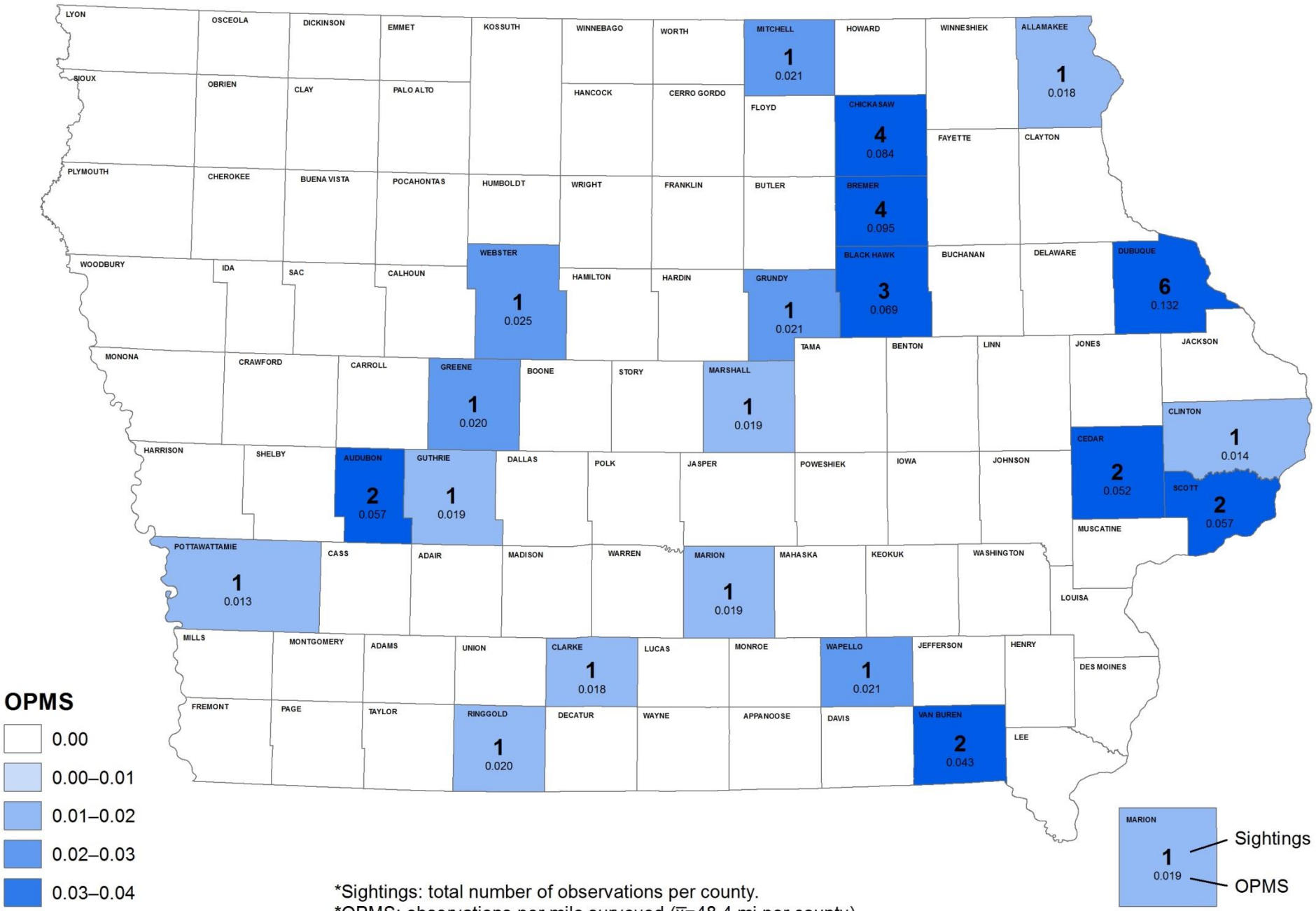


Figure 28. Mean red fox observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means. Red fox includes observations listed as "fox" due to the rarity of gray fox in the state.

Red Fox Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).
*Sightings include observations listed as "fox" and "red fox", exluding "gray fox."

Updated 7/7/17

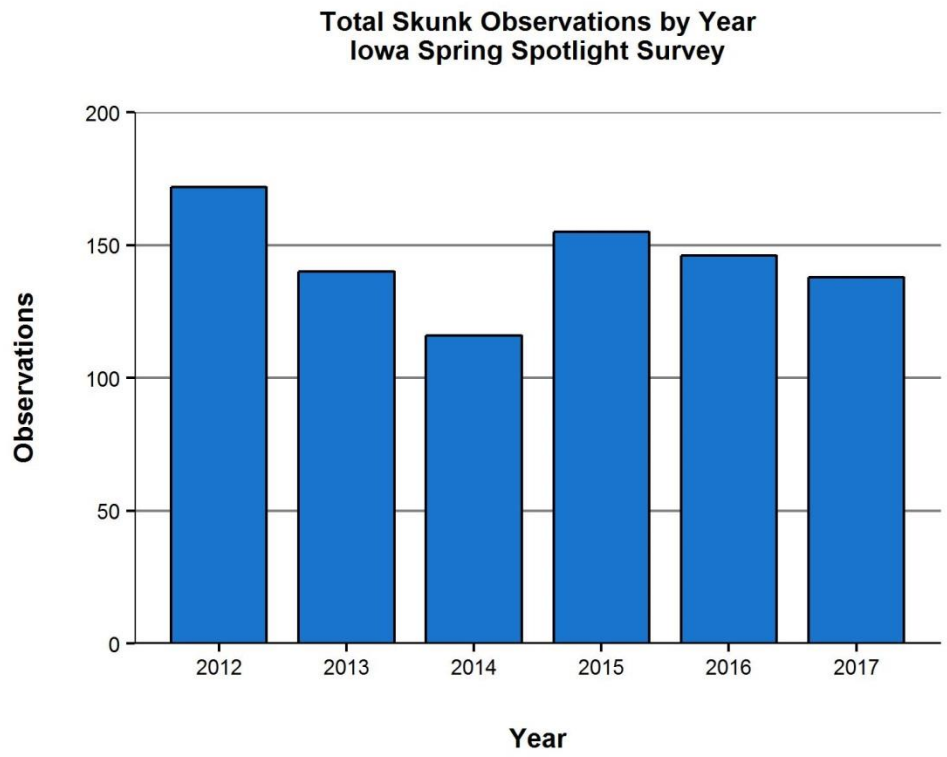


Figure 30. Total skunk observations by year during the Iowa Spring Spotlight Survey, 2012–present.

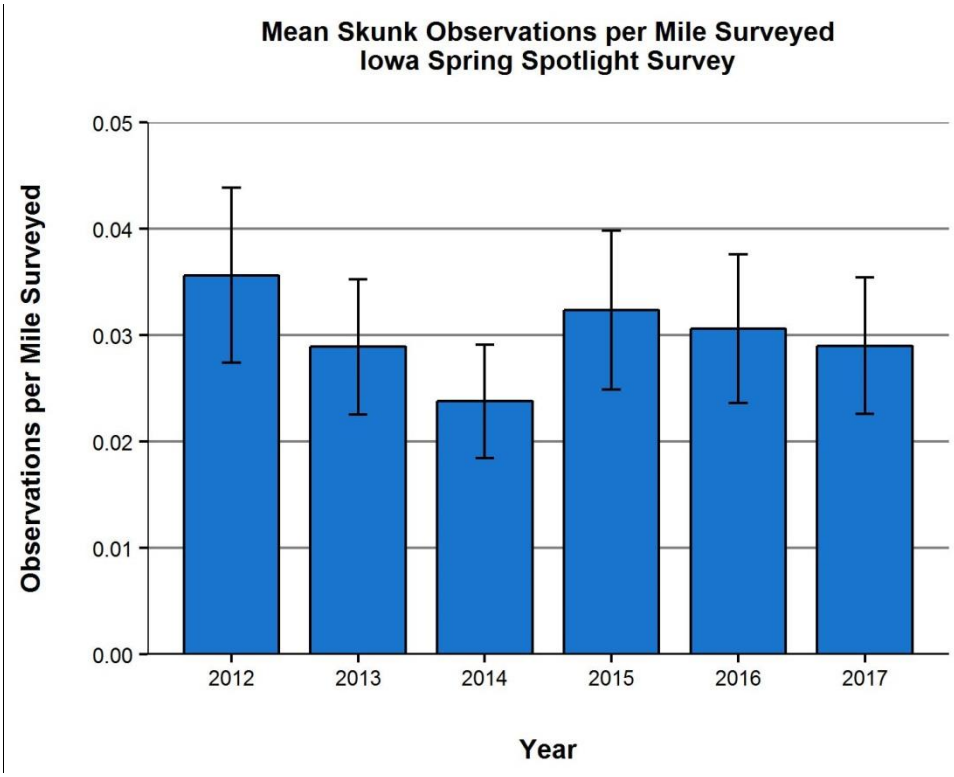


Figure 31. Mean skunk observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means. Skunk includes all observations recorded as "striped skunk" and "skunk" and likely includes none or few spotted skunk observations due to the rarity of the species in the state.

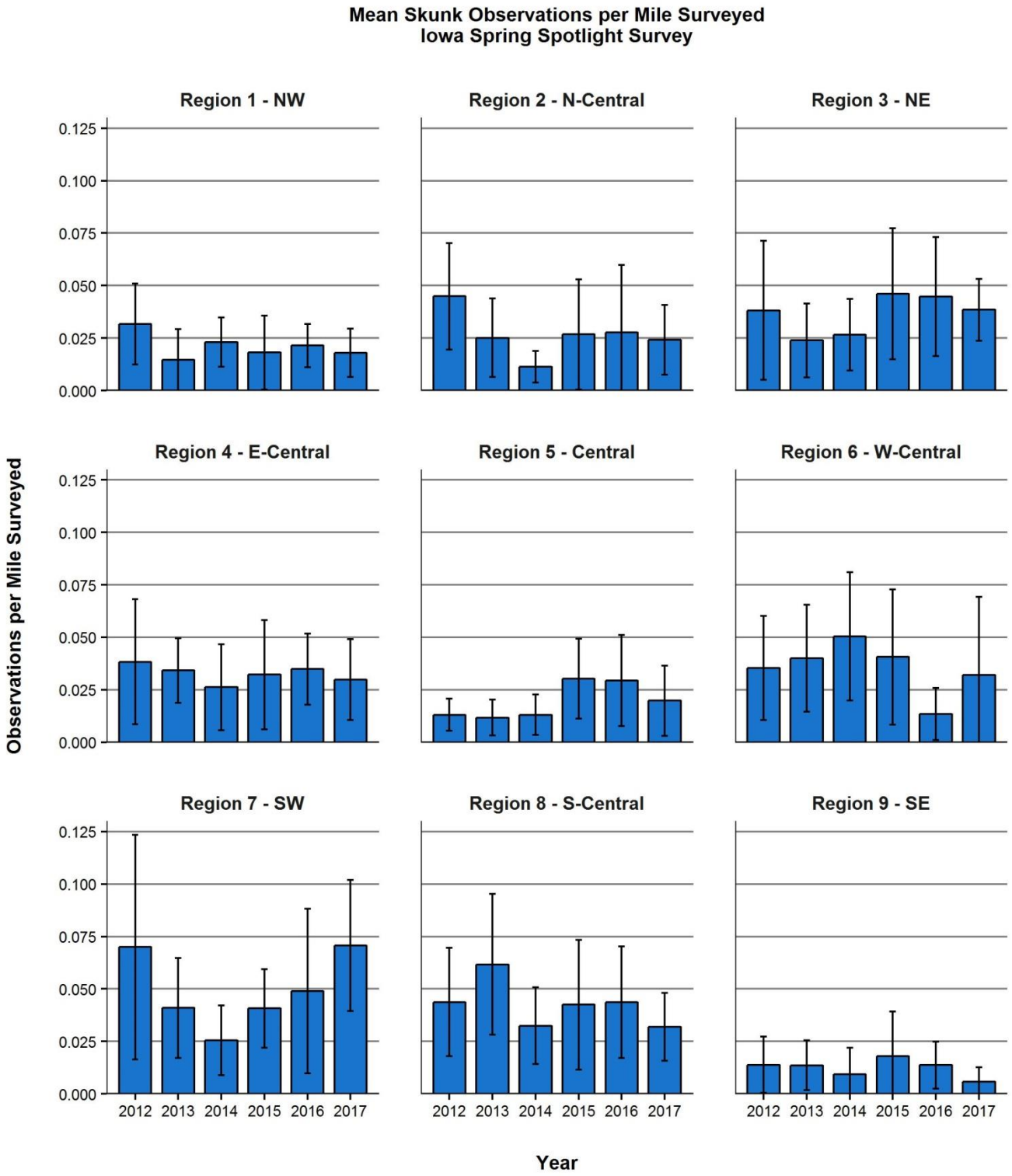
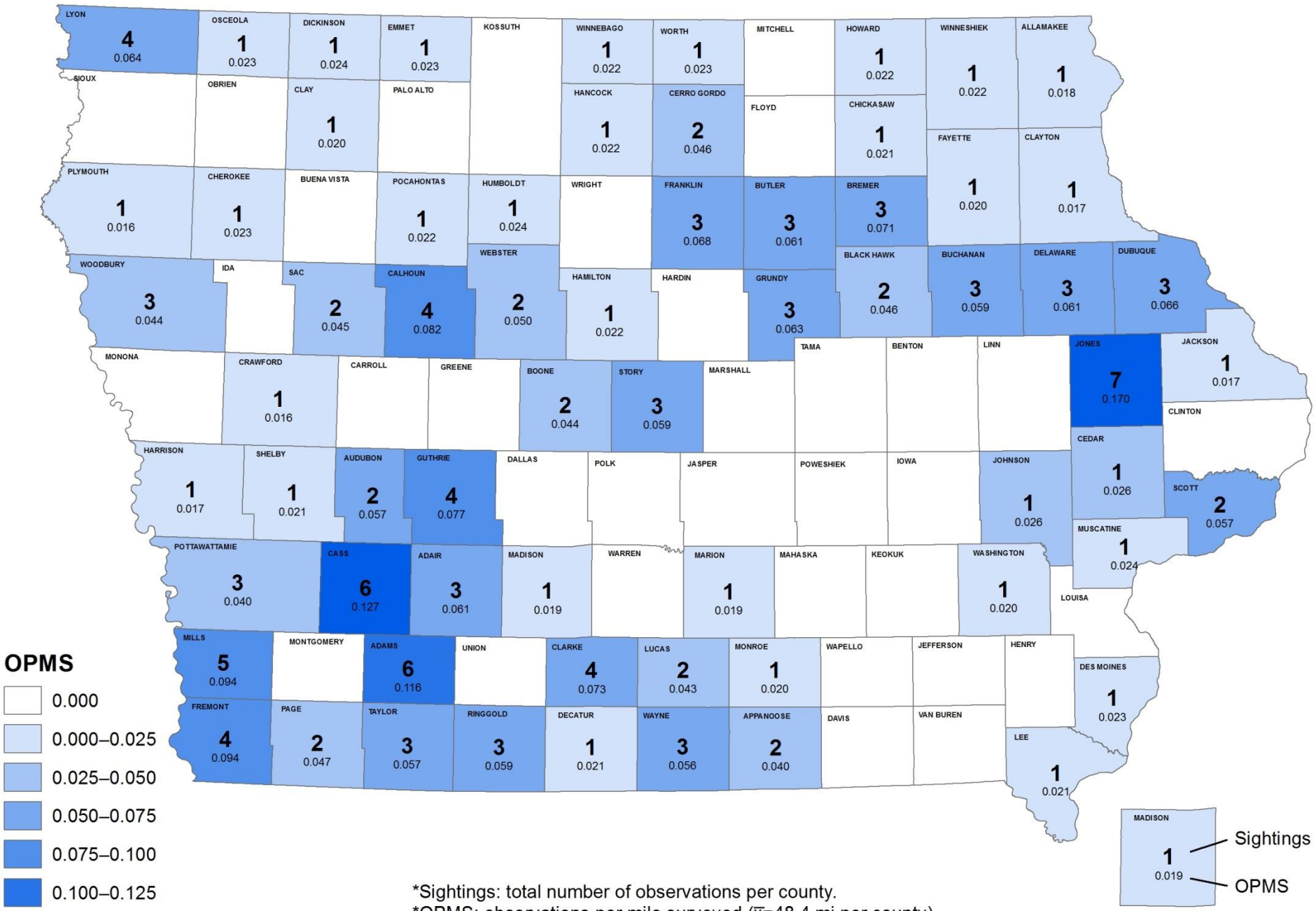


Figure 32. Mean skunk observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means. Skunk includes all observations recorded as "striped skunk" and "skunk" and likely includes none or few spotted skunk observations due to the rarity of the species in the state.

Skunk Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).
*Sightings may include striped skunk and spotted skunk.

Updated 7/7/17

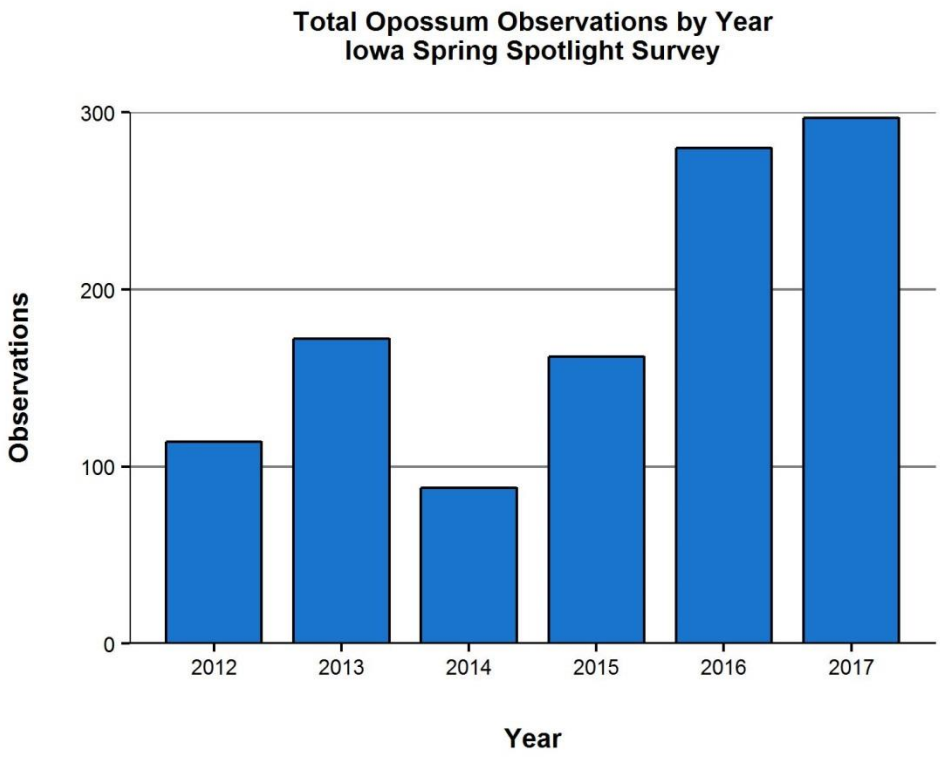


Figure 34. Total Virginia opossum observations by year during the Iowa Spring Spotlight Survey, 2012–present.

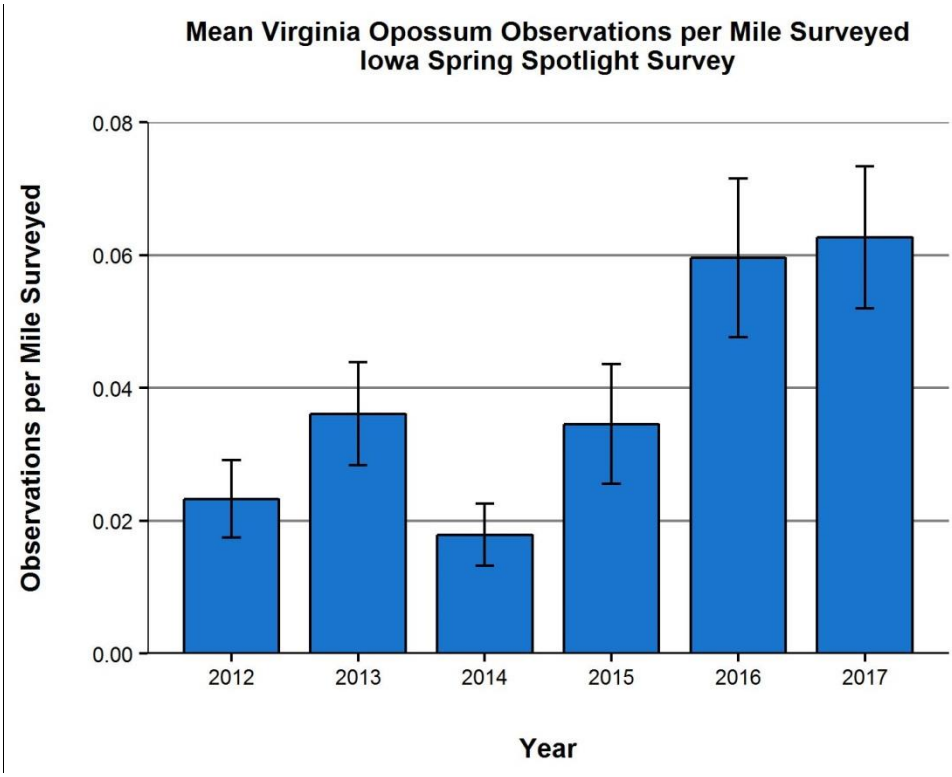


Figure 35. Mean Virginia opossum observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

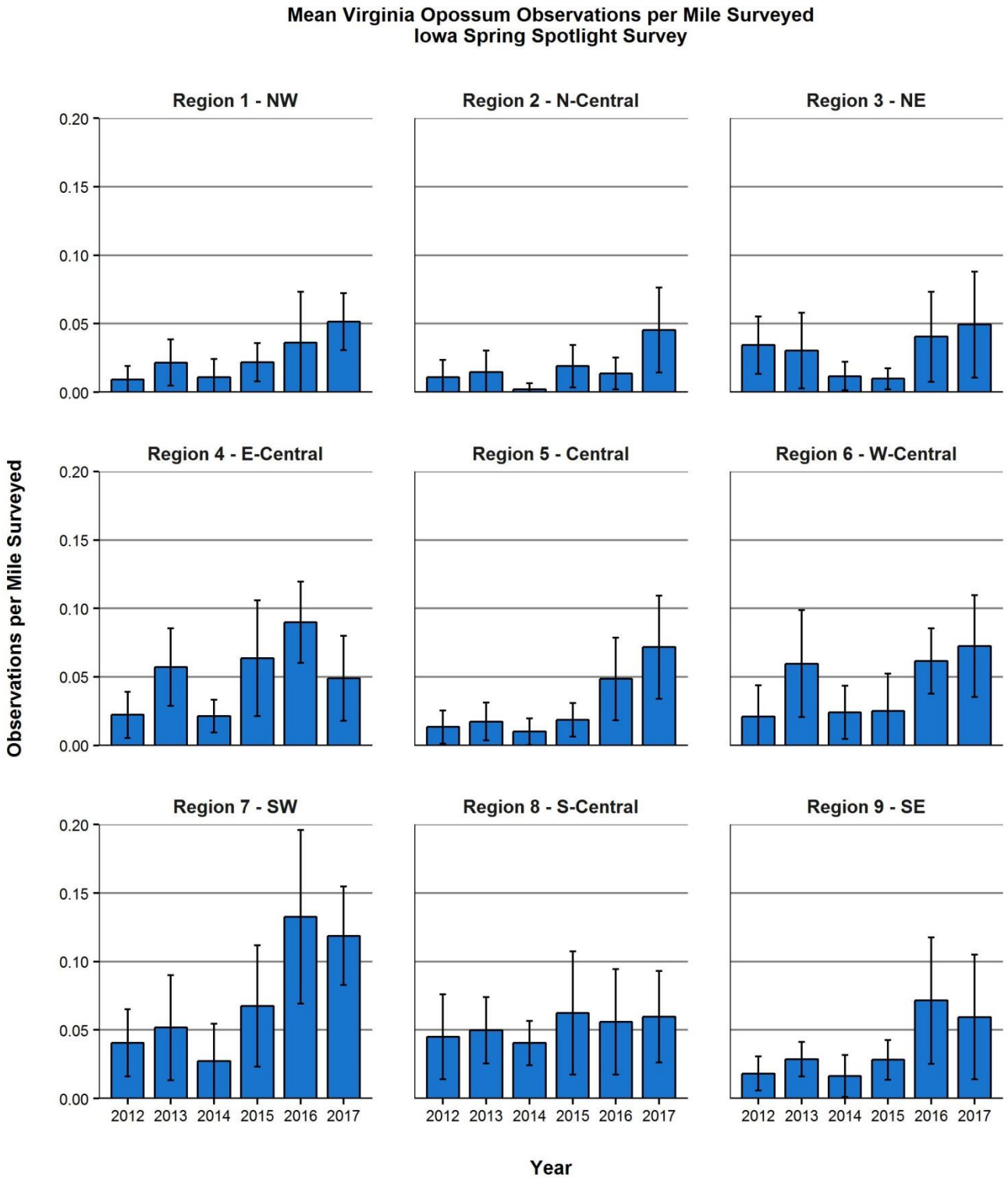
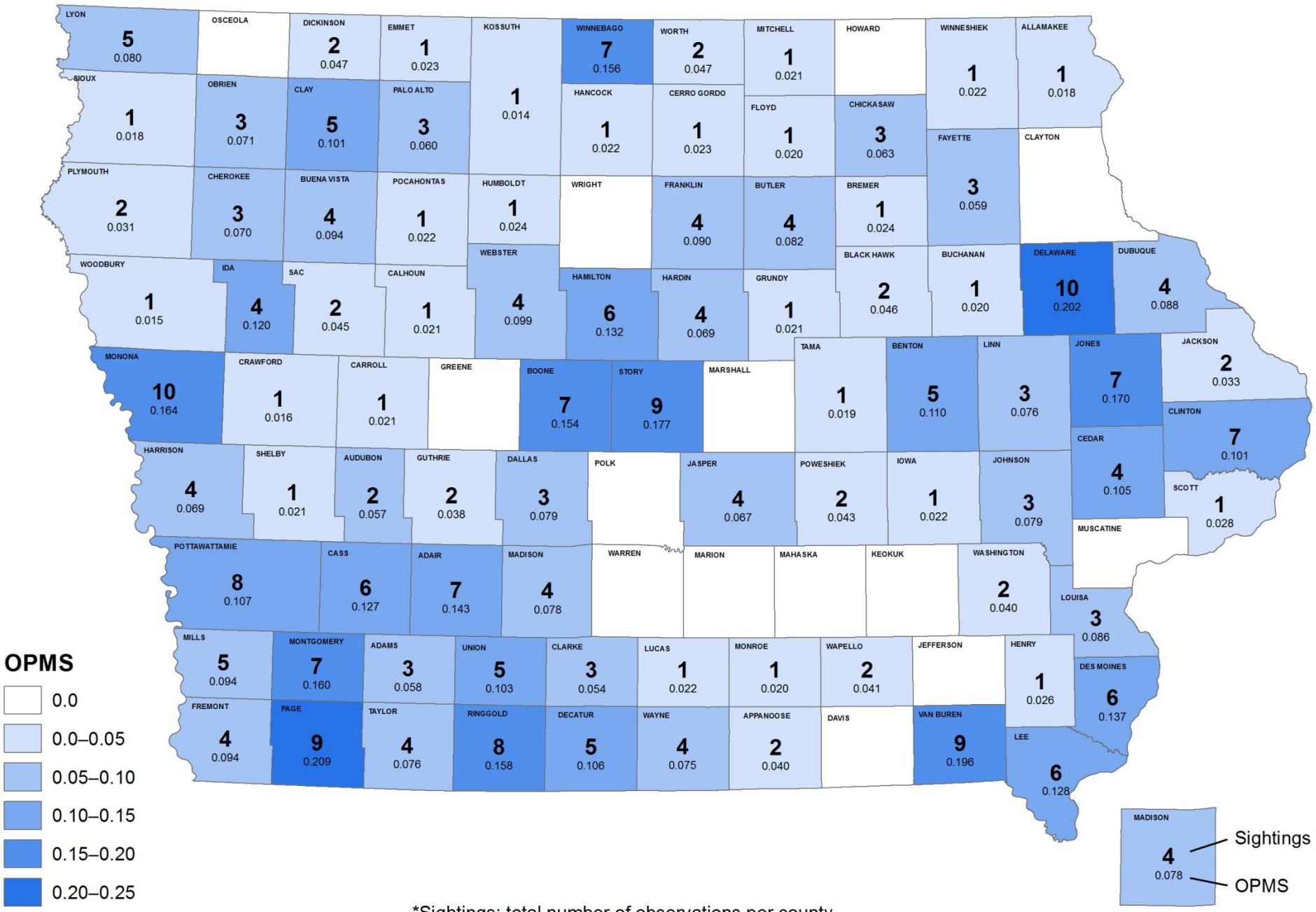


Figure 36. Mean Virginia opossum observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

Virginia Opossum Observations per County
Iowa Spring Spotlight Survey, 2017



*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

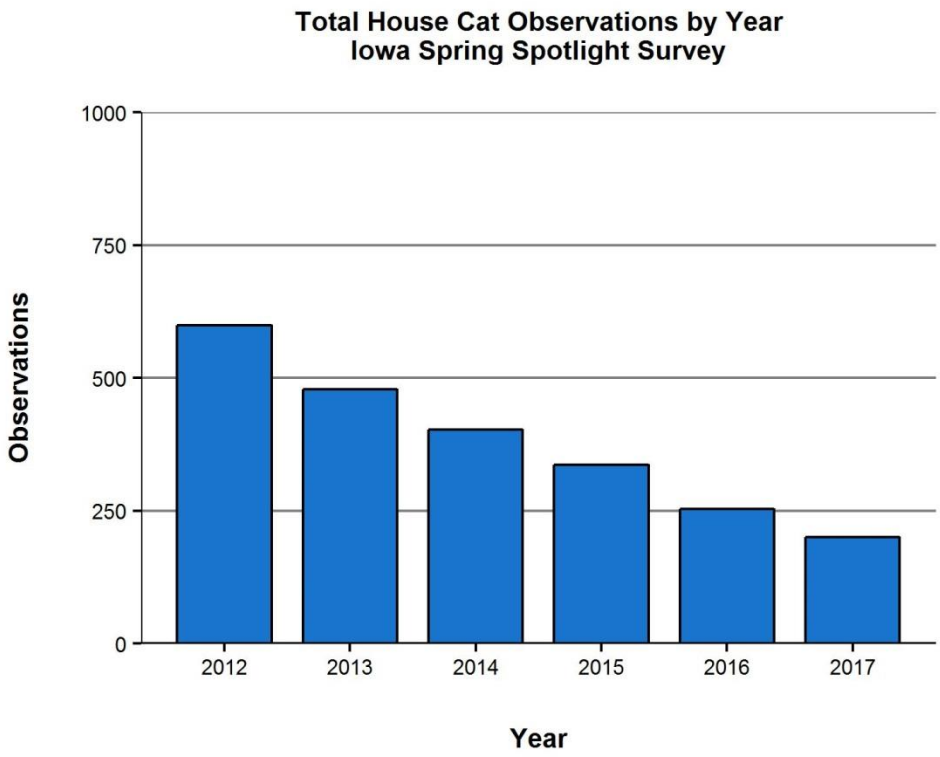


Figure 38. Total house cat observations by year during the Iowa Spring Spotlight Survey, 2012–present.

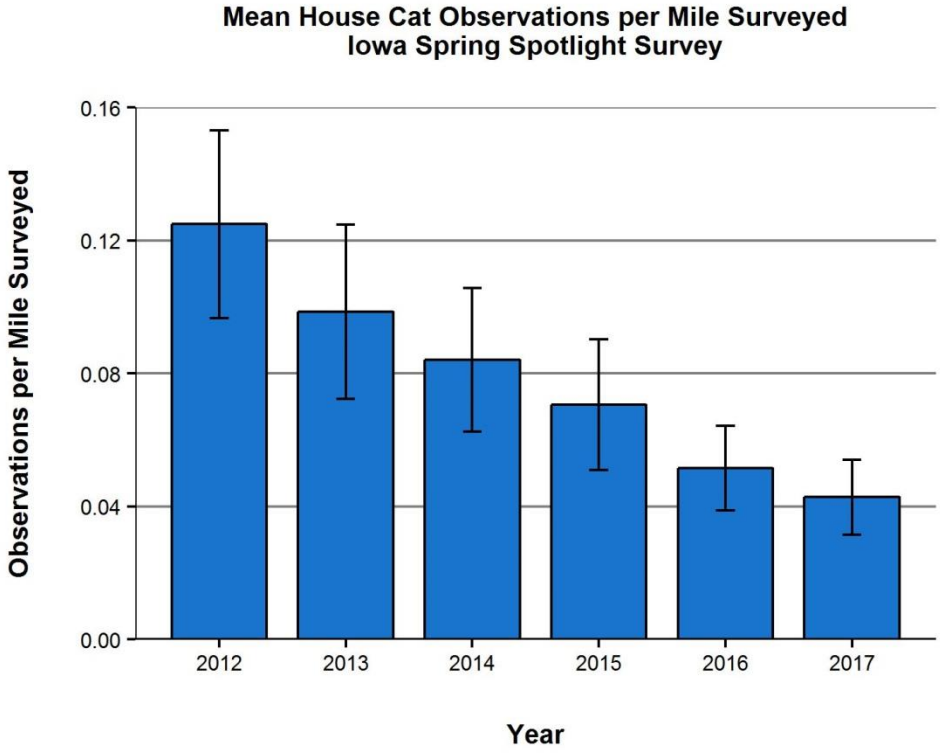


Figure 39. Mean house cat observations per mile surveyed during the Iowa Spring Spotlight Survey, 2012–present. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means.

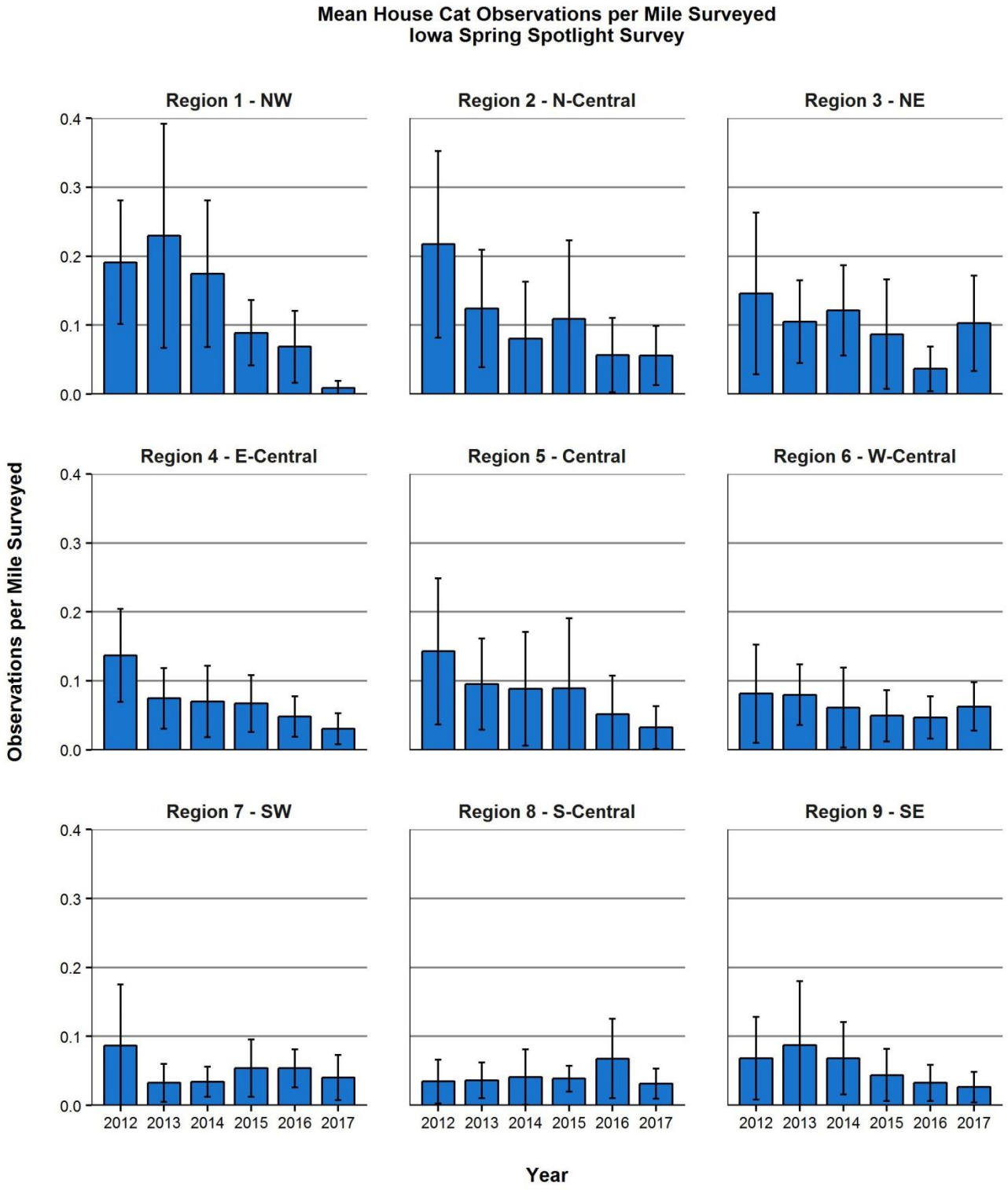
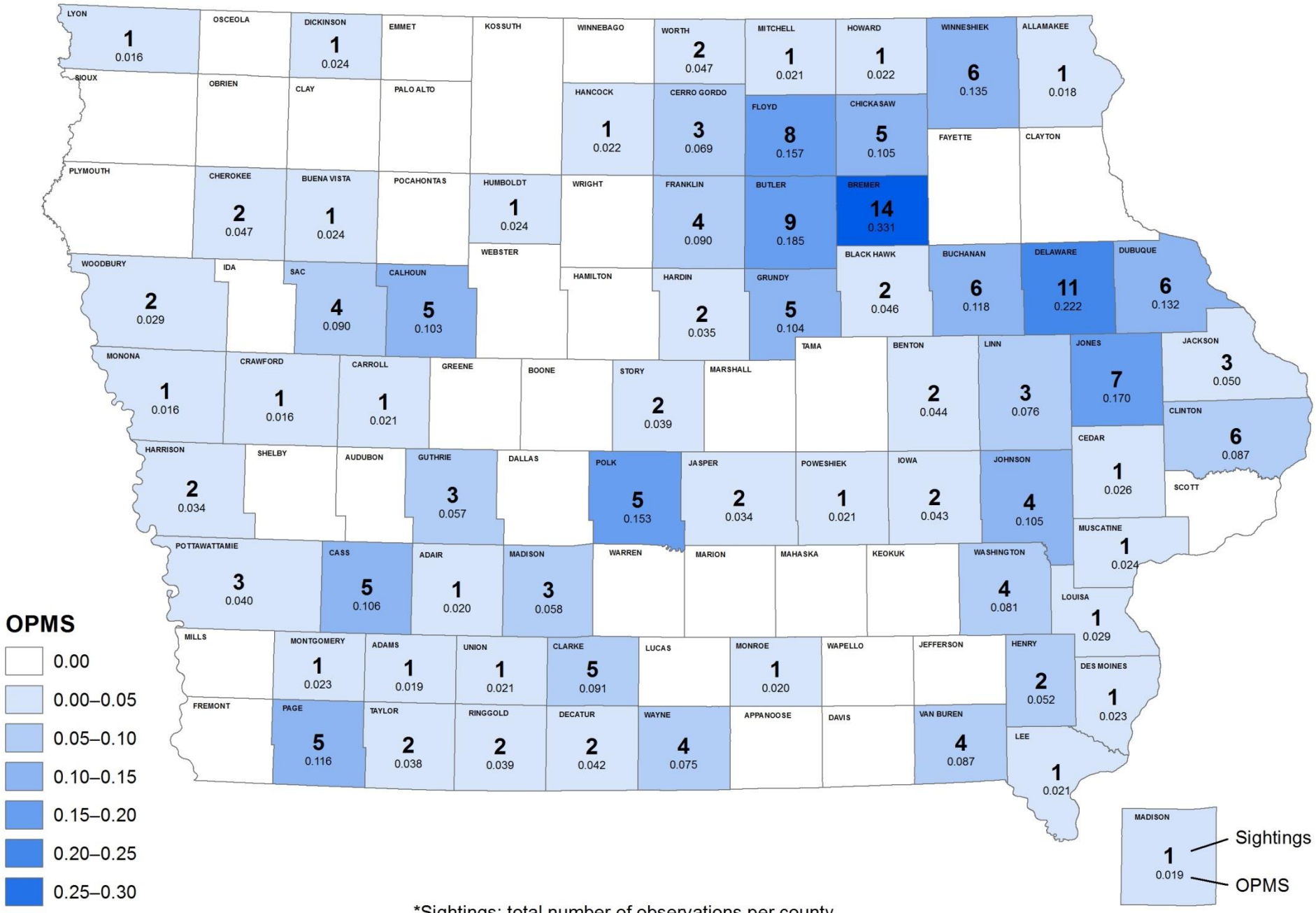


Figure 40. Mean house cat observations per mile surveyed during the Iowa Spring Spotlight Survey for each of the 9 Iowa Department of Natural Resources management regions. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed or transect lengths changed due to annual variation in survey conditions. Error bars represent 95% confidence intervals around the means. Observations were recorded for cats not within close proximity to human residences.

House Cat Observations per County
Iowa Spring Spotlight Survey, 2017



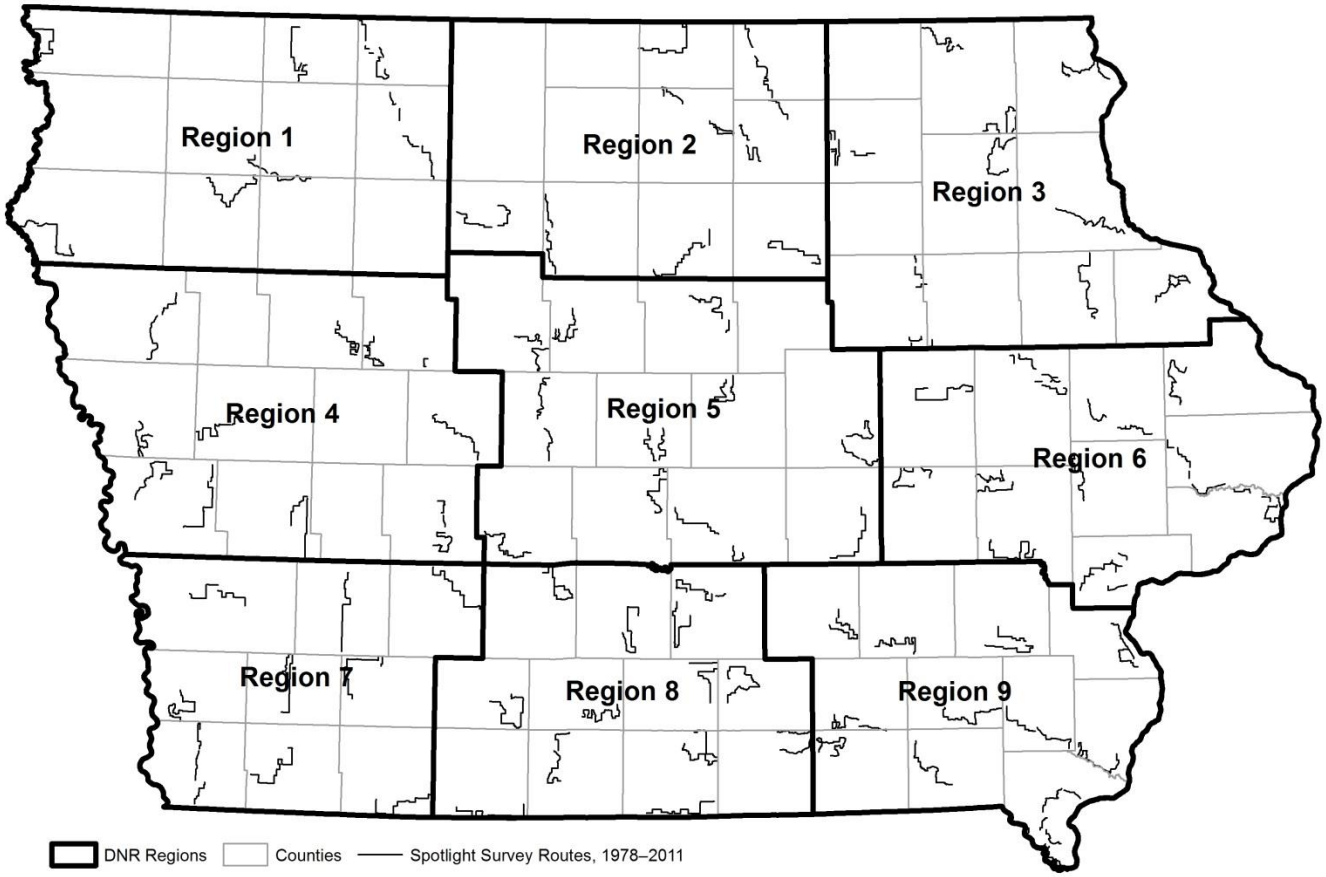
*Sightings: total number of observations per county.
*OPMS: observations per mile surveyed ($\bar{x}$=48.4 mi per county).

Updated 7/7/17

APPENDICES

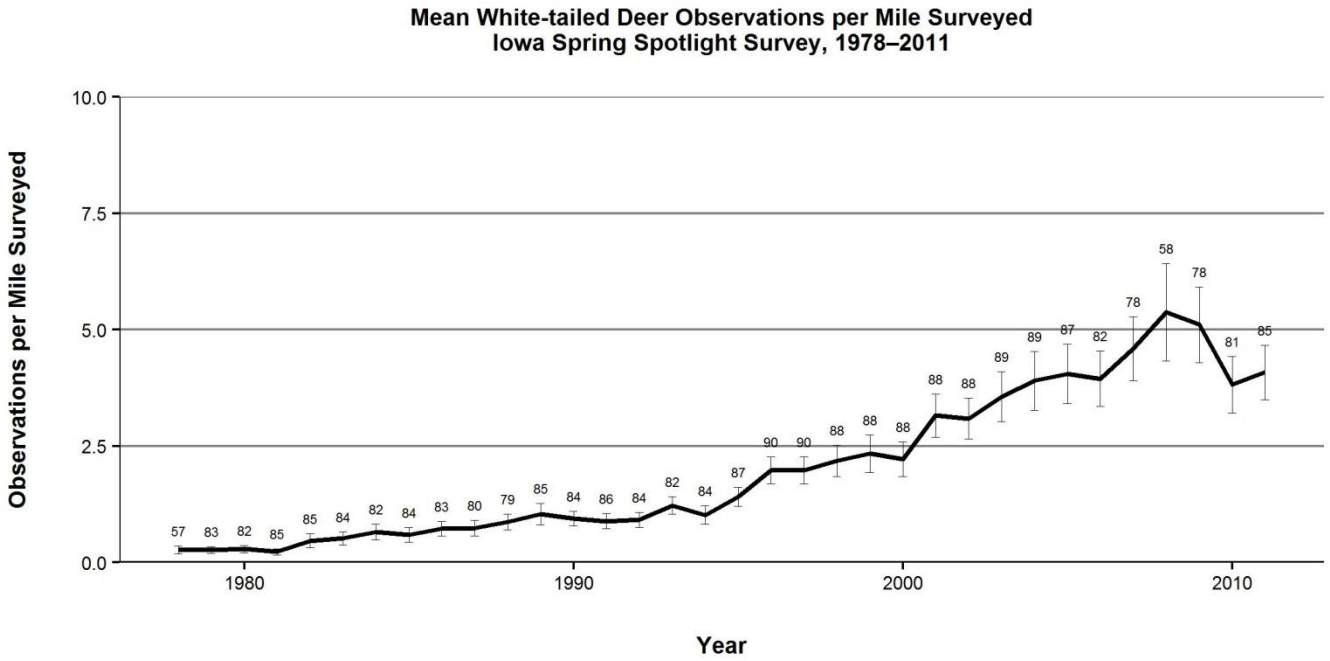
IOWA SPRING SPOTLIGHT SURVEY RESULTS FOR WHITE-TAILED DEER AND NORTHERN RACCOON, 1978–2011

APPENDIX A



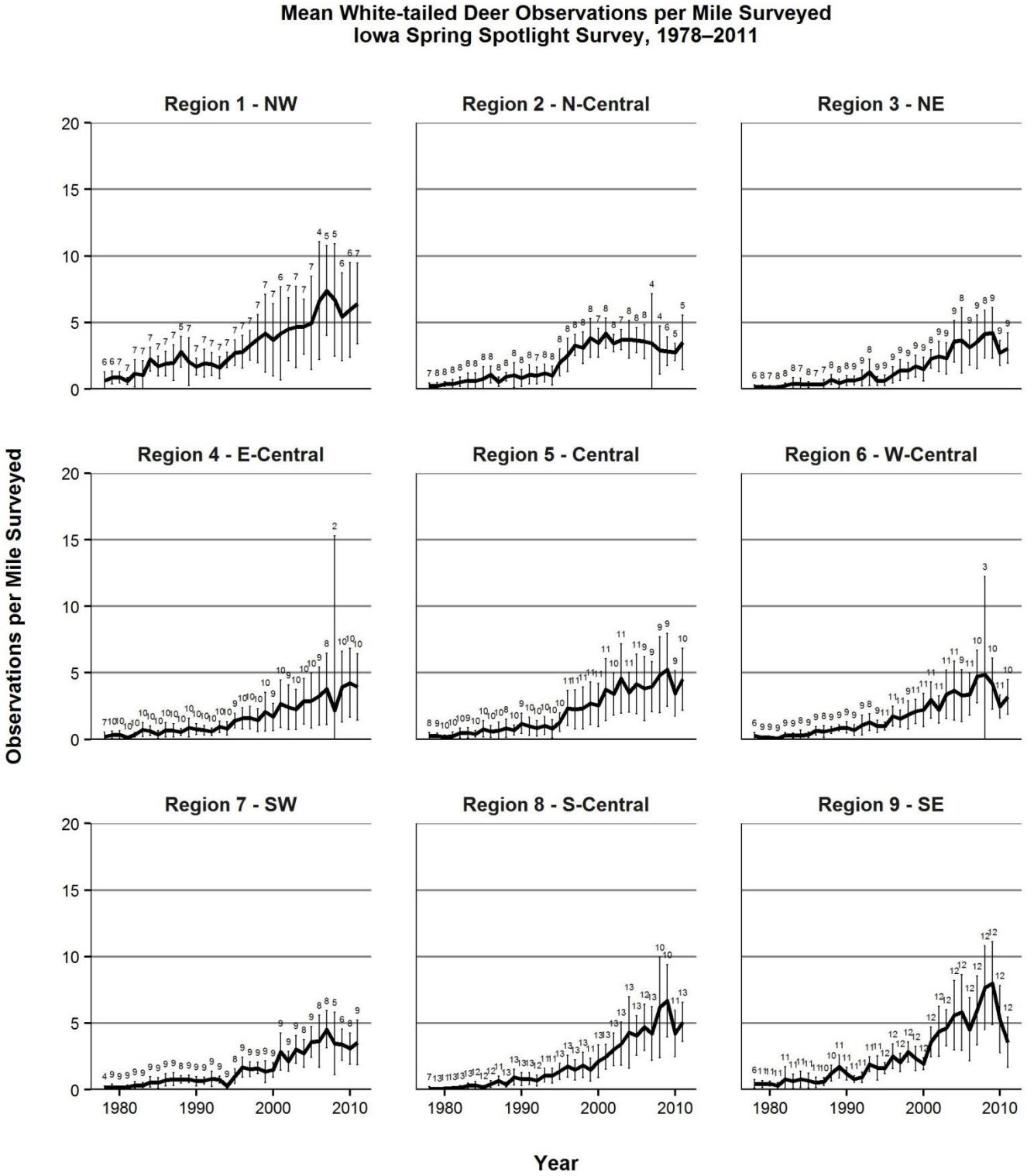
Appendix A. Iowa Department of Natural Resources management regions used for summarizing Spring Spotlight Survey observations and historical Spring Spotlight Survey routes sampled from 1978–2011.

APPENDIX B



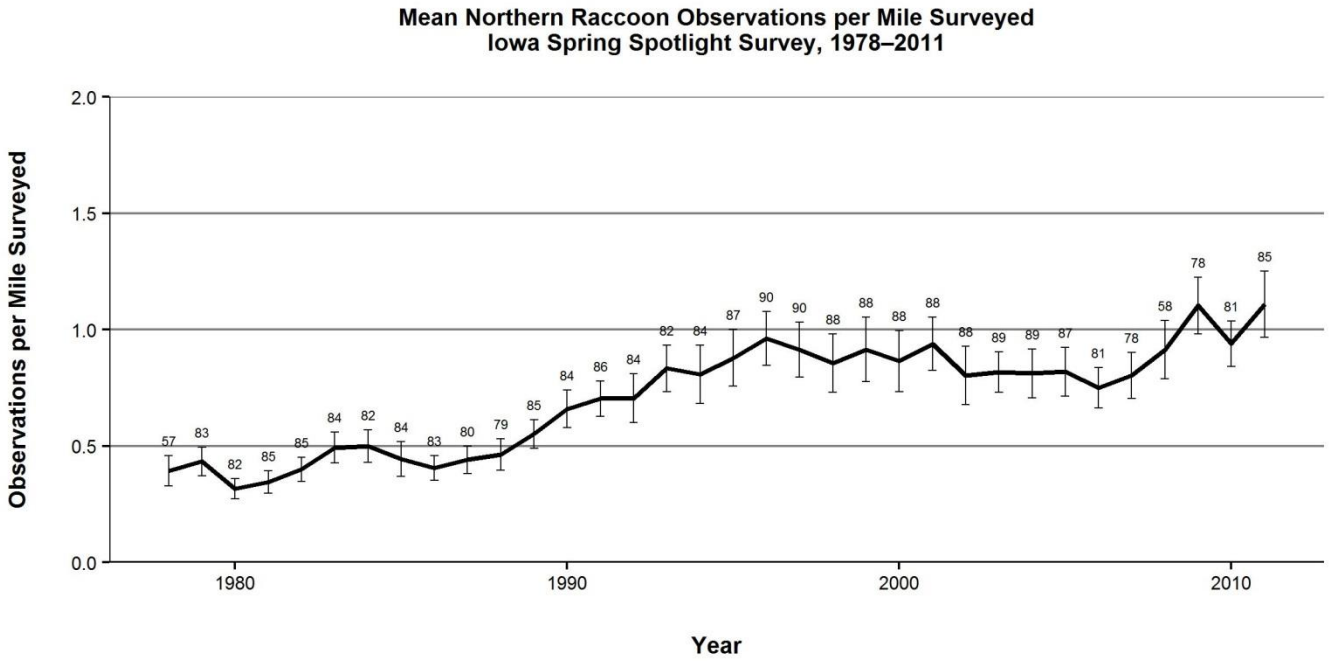
Appendix B. Statewide mean white-tailed deer observations per mile surveyed during the Iowa Spring Spotlight Survey, 1978–2011. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed. Error bars represent 95% confidence intervals around the means. Numbers above error bars indicate the number of transects surveyed each year.

APPENDIX C



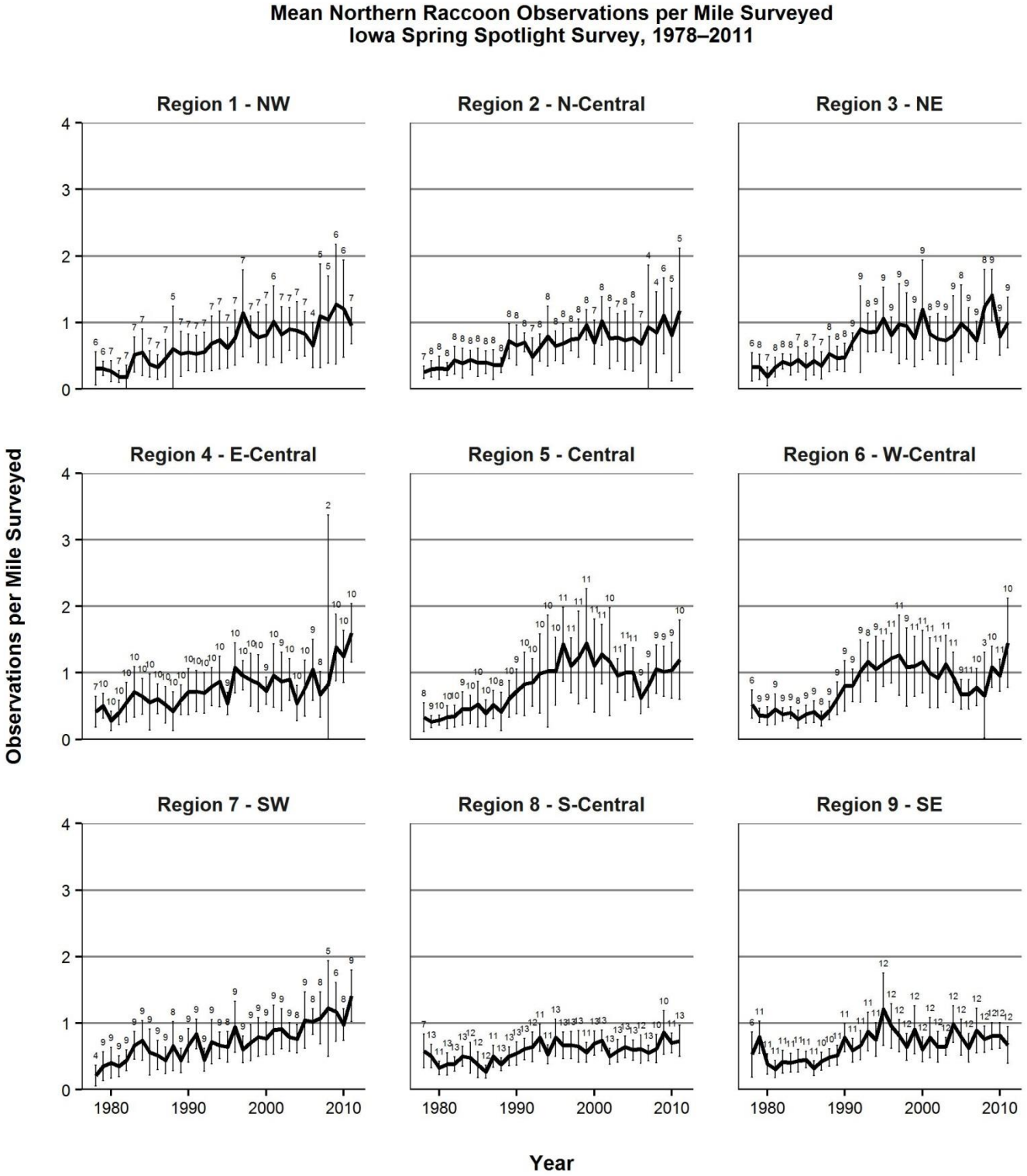
Appendix C. Mean white-tailed deer observations per mile surveyed during the Iowa Spring Spotlight Survey, 1978–2011. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed. Error bars represent 95% confidence intervals around the means. Numbers above error bars indicate the number of transects surveyed each year. Note, surveys were conducted linearly along forested habitats and not standardized by amount of available habitat in each region; thus, cross-regional comparisons should be considered with caution as data represents the relative change in species abundance within each region.

APPENDIX D



Appendix D. Mean Northern raccoon observations per mile surveyed during the Iowa Spring Spotlight Survey, 1978–2011. Observations were standardized by mile surveyed to account for variable number of transects surveyed each year. Error bars represent 95% confidence intervals around the means. Numbers above error bars indicate the number of transects surveyed each year.

APPENDIX E



Appendix E. Mean Northern raccoon observations per mile surveyed during the Iowa Spring Spotlight Survey, 1978–2011. Observations were standardized by mile surveyed to account for regions in which counties were not surveyed. Error bars represent 95% confidence intervals around the means. Numbers above error bars indicate the number of transects surveyed each year. Note, surveys were conducted linearly along forested habitats and not standardized by amount of available habitat in each region; thus, cross-regional comparisons should be considered with caution as data represents the relative change in species abundance within each region.